CONTENTS

FIGURES

TABLES

1. MAPS

The content of this section of the Detailed Site Report (DSR) identifies the location of the Atomic City Global Nuclear Energy Partnership (GNEP) site using state, county, and local scale maps. These maps contain sufficient content and detail to support the preparation of an Environmental Impact Statement (EIS). The maps required in this section document the spatial relationships between the Atomic City site and the 1) surrounding communities, 2) transportation, 3) utility infrastructure, 4) land use, and 5) facility requirements. Table 1-1 identifies the broad range of information found on the five required maps for this section. Additional figures are provided for clarity.

Table 1-1. Map content requirements.

Location	Land Use and Water Bodies	Utilities & Transportation	Facility Requirements
State	Historical sites	Highways	Current zoning
County	Archaeological sites	Railways	Site dimensions
Municipality	Native American lands	Roads	Construction zone
Township, range, section	Federal, state, local parks and natural areas	Transmission corridors	Buildings or structures
Place names	Non-attainment areas	Utility Right-of-way	Exclusion zone
Residential areas	Trust lands		
Schools	Military reservations		
Airports	Flood plains		
Industrial areas	Water bodies		
Commercial areas	Wetlands		
UTM coordinates	Rivers		

A variety of figures and maps are necessary to adequately represent the large amount of required information generated for Section 1, *Maps*, and the other sections of the document. The information is presented in diagrammatic figures and on 11 x 17-inch maps that present higher density information at larger scales. The diagrammatic figures and 11 × 17-inch maps are grouped and located at the end of the descriptive text, prior to the bibliography. The data used to generate maps in this section also apply to the maps in subsequent sections of this report. Additional overlay data is used for figures in other sections of the report, and the sources of these data are addressed within those sections of the report.

1.1 Overview and Summary

The following summarizes the relationships between the Atomic City site and the surrounding communities, transportation and utility infrastructure, land use, and facility requirements.

- The Atomic City site is bounded by undeveloped ranch land to the east, west, north and south, some of which is Bureau of Land Management (BLM) land. The U.S. Department of Energy (DOE)-managed Idaho National Laboratory (INL) is located north of the Atomic City site (1-043).

- Currently there are no existing structures or facilities within the boundaries of the Atomic City site (1-009, 1-012, 1-013, 1-019, 1-026, 1-027). The only nearby facilities within a 6-mile radius of the site are Midway Airport (1-025) and INL (1-042).

- Two historical sites (a segment of the Oregon Trail and the old Salmon River Railroad – now the Union Pacific Railroad) cross the southeastern corner of the Atomic City site (1-026).

- The Atomic City site is above the flood plain, with no water bodies within the 6-mile radius (1-008, 1-010, 1-024, 1-036). Water is available from wells in the Snake River Plain Aquifer beneath the site (3-032).

- The entire Atomic City site is currently zoned as A-Agricultural and a nearby area is zoned as Heavy Industrial (1-056, 1-065).

- The Atomic City site is located approximately 2 miles south of United States (U.S.) Highway 26. The Atomic City site can also be accessed by U.S. Highway 20, approximately 7 miles northwest of the Atomic City exit road (1-017).

- There are few residential areas within 6 miles of the Atomic City site (1-056).

- Railroad access to the Atomic City site is provided by the Union Pacific Railroad line at the southwest corner of the property (1-015).

- Within a 50-mile radius of the Atomic City site, there are four major civil divisions: Arco, Blackfoot, Idaho Falls, and Pocatello (1-023, 1-057).

- The current and historical land use has been agricultural and could be re-zoned for Heavy Manufacturing (1-065).

- There are several federal, state, and local parks or natural areas located within 50 miles of the Atomic City site (1-002, 1-004, 1-006, 1-016).

1.2 Site Location

The Atomic City site covers approximately 3,310 acres (1-055) and is located in the arid, high desert rangeland of east-central Idaho, in Bingham County. It is 46 miles west of Idaho Falls, 32 miles east of Arco, and 31 miles northwest of Blackfoot (1-003, 1-022, 1-023). The Atomic City site is less than 2 miles southwest of U.S. Highway 26, near Midway Airport, and its northern boundaries are approximately 0.1 miles south of the southern boundary of the INL. The Atomic City site is bounded by undeveloped ranch land to the east, west, and south and is wholly located in Bingham County, in Township 1 North, Range 31 East, Sections 4-10 and 15-18 east Boise meridian according to the Public Land Survey System (PLSS). The centroid of the Atomic City site is at 43.43135^{o} north latitude, -112.8407645^{o} east longitude or 4810364.080 northing, 351014.712 easting, zone 12, Universal Transverse Mercator (UTM) coordinates (1-005, 1-012, 1-013).

The specific requirements for presenting site location information are presented in Table 1-2. All required information is available.

Table 1-2. Required Atomic City site boundary and dimension information.

Requirement	Figure
Atomic City site on state map	Figure 1-1
Atomic City site on county map	Figure 1-2
Atomic City site map showing township, range, sections	Figures 1-2, 1-4, and 1-5

Figure 1-1 displays the Atomic City site location within the State of Idaho. Figure 1-2 shows the Atomic City site location in Bingham County relative to other geographic features, such as the INL, as well as township and range information. While not a map requirement, Figure 1-3 shows a photographic view of the Atomic City site, looking northwest. Figures 1-4 and 1-5 show township, range, and section information.

The Atomic City site is comprised of two contiguous land tracts covering approximately 3,310 acres. The irregular boundary is due to the intrusion of small tracts of BLM-owned land into the Atomic City site tract boundary (1-019). The legal description for these two tracts (A and B) is (1-012, 1-013, 1-035):

> **Tract A is located in Sections:** 4 (SE ¼, E ½ SW ¼), 9 (E ½, E ½ SW ¼ , SE ¼ NW ¼), 10 (SW ¼ , S ½ NW ¼ , NW ¼ NW ¼), 15 (N ½ NW ¼ excepting therefrom the South, 100 feet) and 16 (N ½ NE ¼ , excepting therefrom the South 100 feet).
>
> **Tract B is located in Sections:** 5 (E ½ SE ¼, SW ¼), 6 (SE ¼), 7 (E ½ E ½, NW ¼ NE ¼), 8 (all), 9 (SW ¼ NW ¼, W ½ SW ¼), 10 (NE ¼ NW ¼), 16 (NW ¼ NW ¼ , excepting therefrom the South 100 feet), 17 (N ½ NE ¼ , excepting therefrom the South 100 feet), 17 (SW ¼ NE ¼ , NW ¼ , excepting therefrom the South 100 feet of the NE ¼ NW ¼ and excepting therefrom the South 100 feet of the East 240 feet of the NW ¼ NW ¼) and 18 (E ½ NE ¼ , SE ¼ NW ¼ , W ½ SE ¼ , NE ¼ SE ¼ , E ½ SW ¼ , lots 3 and 4 [found in the SW¼ SW ¼]).

1.3 Site Boundary and Dimensions

The specific requirements for presenting site boundary and dimensions are shown in Table 1-3. All the required information is available; however, because there are no structures or facilities within the Atomic City site boundaries none are depicted in the referenced figures (1-055).

Table 1-3. Required Atomic City site boundary and dimension information.

Requirement	Figure
Atomic City site boundary, perimeter dimensions	Figure 1-4
Atomic City site area	Figure 1-4
Exclusion area	Figure 1-4
Structures and facilities	N/A
Major Land Use (U.S. Geological Survey [USGS] land use/land cover classifications)	Figure 1-4

Figure 1-3 is a photo illustrating a typical view of the Atomic City site. This photo was taken from the eastern side of the Atomic City site looking northwest across the site. The estimated boundary and linear perimeter dimensions of the Atomic City site, 3,310 acres, is depicted in Figure 1-4. In the absence of a programmatic conceptual facility design, it is not possible to identify the exclusion area, although on Figure 1-4 the typical exclusion area for a Light Water Reactor (LWR) facility is indicated as a 1-mile circle radiating from the suggested construction area (1-059).

Figure 1-4 identifies the major land uses in the context of the USGS land use classification system and the exclusion area (1-010, 1-018, 1-019). The USGS land use classification system provides nine Level I primary land use classes and 37 Level II secondary land use classes. The five primary land uses in the Atomic City site area are: 1 Urban or Built-up Land, 2 Agriculture, 3 Rangeland, 4 Forest Land and 7 Barren Land. Nine secondary land uses are noted on Figure 1-4 as follows: 11 Residential, 21 Cropland and Pasture, 24 Other Agricultural Land, 31 Herbaceous Rangeland, 32 Shrub and Brush Rangeland, 33 Mixed Rangeland, 42 Evergreen Forest Land, 74 Bare Exposed Rock, and 76 Transitional Areas. These land use classes are also shown for a 10-kilometer (6-mile)area in Section 1.5, Figure 1-6.

1.4 Zoning, Structures, and Transportation

The specific requirements for presenting zoning, transportation routes, and buildings/structures are presented in Table 1-4. Figure 1-5 depicts the zoning and major transportation routes within and immediately adjacent to the Atomic City site. Currently, there are no structures or facilities within the Atomic City site; therefore, none are depicted in the figures contained in this section. In the absence of a facility conceptual design, a detailed construction zone with locations of planned buildings and structures cannot be proposed, though it is assumed that the facilities will be centrally located within the Atomic City site boundary.

Table 1-4. Required buildings and structures information.

Requirement	**Figure**
Atomic City site construction zone	N/A
Atomic City site zoning classification	Figure 1-5
Planned buildings and structures	N/A
Transportation routes	Figure 1-5

The entire Atomic City site is currently zoned A-Agricultural (1-056, 1-065). A smaller area on adjacent property, the southeastern quarter of Section 3, is zoned for C2-Heavy Commercial use. The current and historical land use has been agricultural for producing hay and grazing livestock. While currently zoned for agricultural use, the property can be re-zoned for Heavy Manufacturing according to the Bingham County Planning and Zoning Board (1-065). U.S. Highway 26 is the closest Federal highway although U.S. Highway 26 joins U.S. Highway 20 approximately 7 miles northwest of the Atomic City exit road (1-015, 1-017). Railroad access to the Atomic City site is provided by the Union Pacific Railroad line at the southwest corner of the property.

1.5 Site Characteristics within 10 Kilometers

The map requirements for site characteristics within a 10-kilometer (6-mile) radius (1-058) from the boundaries of the irregularly shaped site are presented in Table 1-5. Location data are available for all 29 required categories; however, 13 of the 29 do not occur within the 10-kilometer (6-mile) radius and are designated as “N/A.” Archaeological sites do exist at the Atomic City site, but are not depicted on Figure 1-6 because law prohibits the public dissemination of archaeological site locations. These cultural resource sites are discussed in detail in Section 7, *Historical, Archaeological, and Cultural Resources*, of this report.

Table 1-5. Required characteristics of the Atomic City site located within the 10-kilometer (6-mile) radius.

Requirement	**Figure**
Atomic City site boundary with 10-kilometer (6-mile) radius	Figure 1-6
County and local boundaries	Figure 1-6
Railroads	Figure 1-6
Place names	Figure 1-6
Residential areas	Figure 1-6
Schools	N/A
Airports	Figure 1-6
Industrial and commercial area	Figure 1-6
Roads	Figure 1-6
Facilities	Figure 1-6
Prisons	N/A
Major land uses (USGS classification)	Figure 1-6
Current zoning classification	Figure 1-5
Utility right-of-way	Figure 1-6
Rivers and flood plains	N/A
Water bodies and wetlands	N/A
Trust lands	N/A
Historic sites (trails)	Figure 1-6
Archaeological sites	N/A
Native American lands	N/A
Military reservations	N/A
Federal, state, local parks and natural areas	N/A

Figure 1-6 shows a vicinity map with a 10-kilometer (6-mile) (1-058) radius from the outer borders of the Atomic City site boundary (1-055) (hence the perimeter is not a perfect circle). County and local municipality boundaries are shown for Bingham and Butte County (1-0051-031, 1-031) and Atomic City, Idaho. Midway Airport is the only airport within a 10-kilometer (6 miles) radius. The only residential area located within the 10-kilometer (6-mile) radius is Atomic City (1-056); however. There are three potential structures visible on aerial photos east and southeast of Atomic City that could be residential units.

Figure 1-7 depicts land ownership adjacent to the site and publicly held lands near the site managed by the BLM and the State of Idaho (1-009). Major land uses are provided with land classification consistent with USGS categories (previously described in Section.1.2) (1-018, 1-019). The Atomic City site is not located within the flood plain and no water bodies are within the 10-kilometer (6-mile) radius (1-008, 1-010, 1-024). The described area contains no designated as wetlands, nor are there any designated federal, state, and local parks or natural areas within the 10-kilometer (6-mile) radius (1-002, 1-004, 1-006, 1-016).

The information identified in Table 1-5 is shown in Figure 1-6. Localized zoning (1-056, 1-065) classifications in and immediately adjacent to the site are shown in Figure 1-5.

1.6 Site Characteristics within 80 Kilometers

The specific map requirements for identifying site characteristics within an 80-kilometer (50-mile) radius (1-057) around the site are presented in Table 1-6. Location data are available for all the required elements occurring within the 80-kilometer (50-mile) zone and are illustrated in Figure 1-7.

There are four major civil divisions, or cities, within the 80-kilometer (50-mile) radius: Arco (32 miles west) (1-003, 1-022, 1-023), Blackfoot (31 miles southeast), Idaho Falls (46 miles east), and Pocatello (53 miles southeast). U.S. Highways 20, 26, and 33 provide the major east-west transportation routes. U.S. Interstate 15 provides the major north-south transportation route (1-017). The Union Pacific Railway runs northwest from Pocatello through the southwestern edge of the Atomic City site.

The major water bodies and flood districts are shown on Figure 1-7. The major water bodies are: Snake River (approximately 25 miles southeast of the Atomic City site), American Falls Reservoir (approximately 25 miles south of the Atomic City site), Mud Lake (approximately 30 miles northeast of the Atomic City site) and Market Lake (approximately 40 miles northeast of the Atomic City site) (1-008, 1-101, 1-024). See Section 11, *Hydrology/Flooding*, for detailed discussion on hydrology and flooding.

Table 1-6. Required characteristics of the Atomic City site located within the 80-kilometer (50-mile) radius.

Requirement	Figure
80-kilometer (50- mile) radius from Atomic City site location	Figure 1-7
Major civil divisions	Figure 1-7
Highways	Figure 1-7
Rivers and flood plains	Figure 1-7
Water bodies	Figure 1-7
Transmission corridors (utility lines)	Figure 1-7
Native American lands	Figure 1-7
Military reservation	None present
Federal, state, local parks and natural areas	Figure 1-7
Clean Air Act (CAA) Non-attainment and Maintenance Areas	Figure 1-7

Designated federal, state, and local parks or natural areas, such as Craters of the Moon National Monument and Preserve, are located within the 80-kilometer (50-mile) radius (1-002, 1-006, 1-009, 1-016). The Fort Hall (Bannock-Shoshone Tribes) Reservation is located approximately 27 linear miles from the Atomic City site (1-009, 1-019). The U.S. Forest Service manages high elevation lands to the northwest of the Atomic City site (1-009, 1-019). The DOE-managed INL is located to the north of the Atomic City site (1-043).

There are local parks in Arco, Idaho Falls, Shelley, Blackfoot, and Pocatello (1-018, 1-019). The Craters of the Moon National Monument & Preserve is located within the 80-kilometer (50-mile) radius west of the Atomic City site. The sole nonattainment area on this map view is located in the Portneuf Valley surrounding Pocatello and is within the 80-kilometer (50-mile) radius of the Atomic City site. Nonattainment areas are addressed in Section 10, *Weather/Climatology*, and Section 12, *Regulatory and Permitting* (1-001, 1-011, 1-014).

1.7 Future Site Improvements

Future site improvements will be necessary to support construction and operation of GNEP facilities at the Atomic City site. The Atomic City site is located near U.S. Highway 26 and two electrical power distribution lines exist in close proximity. An existing section of railroad track crosses the south west corner of the property and approximately 2 miles of new track construction would be required to reach it from the northwest portion of the site.

1.7.1 Road Access

Construction of new roads or upgrading of existing asphalt and dirt roads would be required to access the site from U.S. Highway 26. Routing of these roads would either be east through Atomic City to meet the existing U.S. Highway 26, approximately 3 miles from the center of the Atomic City site, or north across INL property to reach U.S. Highway 26, approximately 3.7 miles. Either road access would require acquisition of rights-of-way, and roads would need to be designed and constructed in accordance with the requirements of the *Idaho Transportation Department Standard Specification for Highway Construction, 2004* (1-062).

1.7.2 Railroad Spur Access

An existing section of railroad track owned and operated by Union Pacific crosses the property. New track construction would be required of approximately 2.2 miles in length to reach the existing railroad track located in the southwest corner of the site. Sufficient right-of-way clearances would need to be established. All track design and construction will be governed by the Union Pacific *"Technical Specifications for Construction of Industrial Tracks,"* Union Pacific Chief Engineer's Standards and Common Standards, and Union Pacific Chief Engineer's Instruction Bulletins (1-063).

1.7.3 Utilities

Two electrical power distribution lines are in close proximity to the Atomic City site. A 230 kilovolt distribution line exists to the west approximately 4.7 miles from the center of the Atomic City site. A 161 kilovolt distribution line exists to the east approximately 12.4 miles from the center of the Atomic City site. Construction and maintenance of a new line and substation from either of these connections will require acquisition of rights-of-ways and clearances.

1.7.4 Water Supply

Two wells are located on the Atomic City site and are available to furnish water for GNEP facilities. The wells have historically been used to suppy water for irrigation and are currently used for stock watering. The existing wells could be upgraded or new wells could be constructed for industrial use. New water wells would be constructed and installed according to the Idaho Department of Water Resources (IDWR) well construction standards rules (1-064).

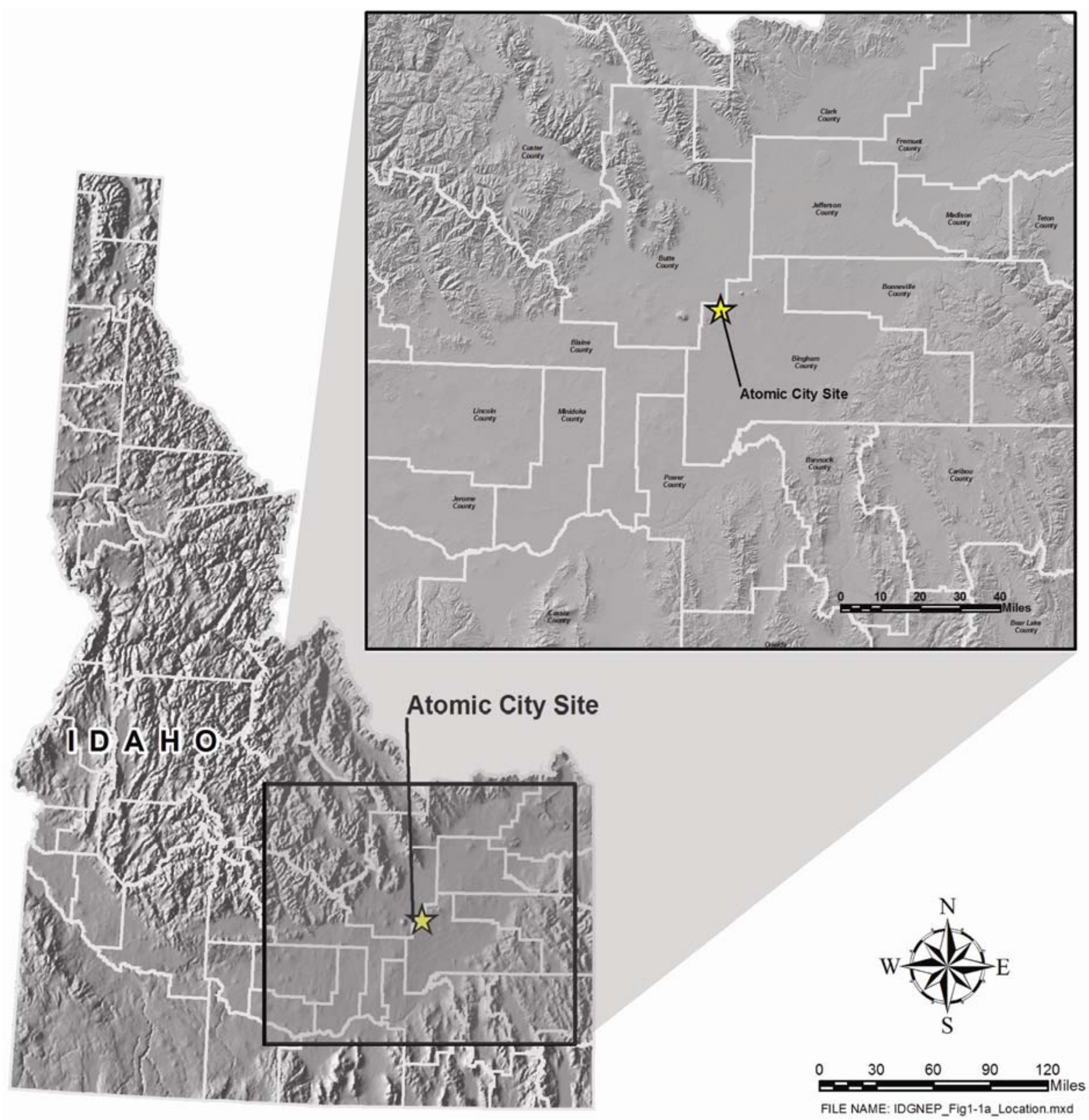

Figure 1-1. Location of the Atomic City site, Bingham County, Idaho (1-005, 1-047, 1-060).

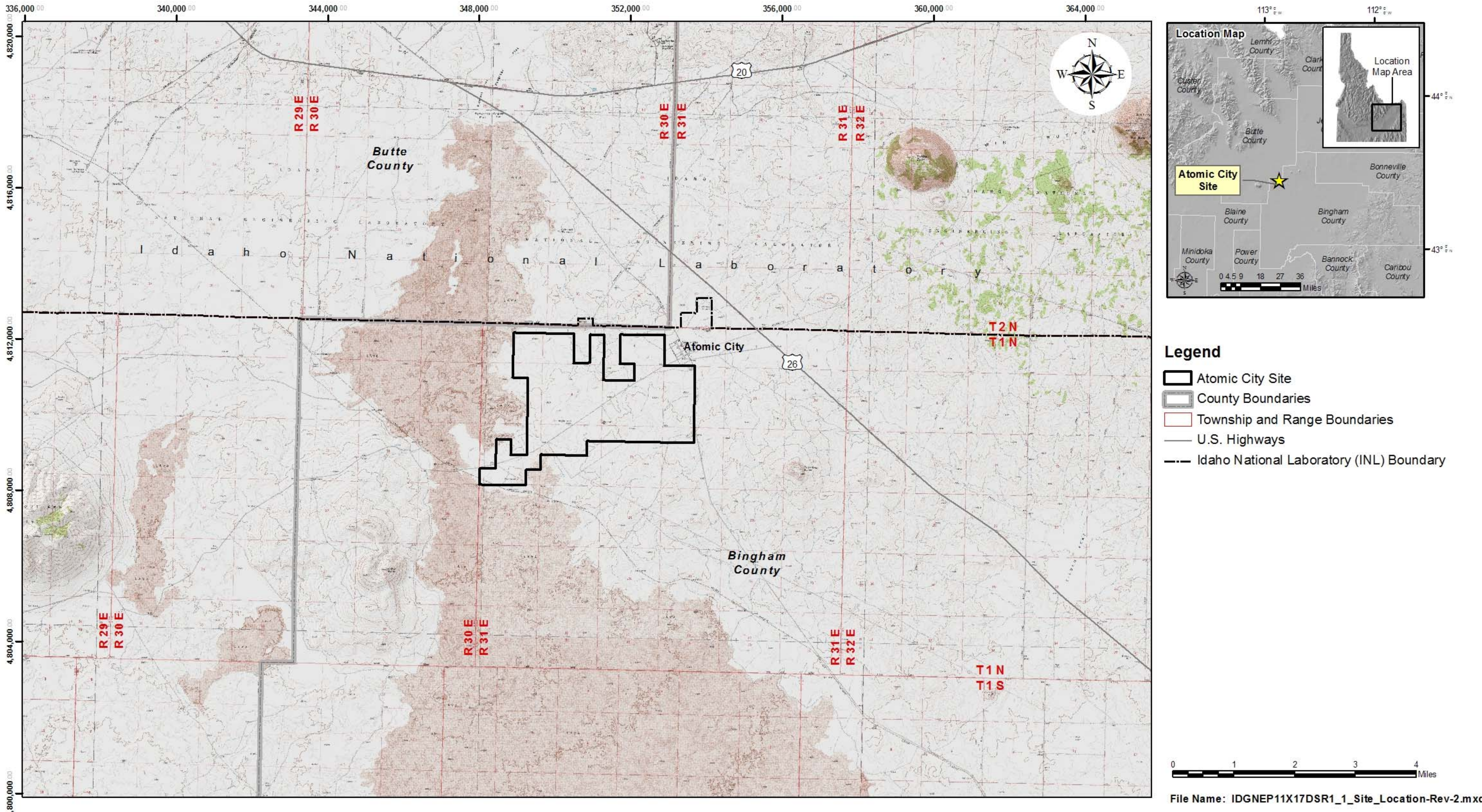

Figure 1-2. Location of the Atomic City site by township, range, section and UTM coordinates (1-005, 1-012, 1-013, 1-035, 1-043, 1-047, 1-055).

Figure 1-3. View of Atomic City site, looking northwest.

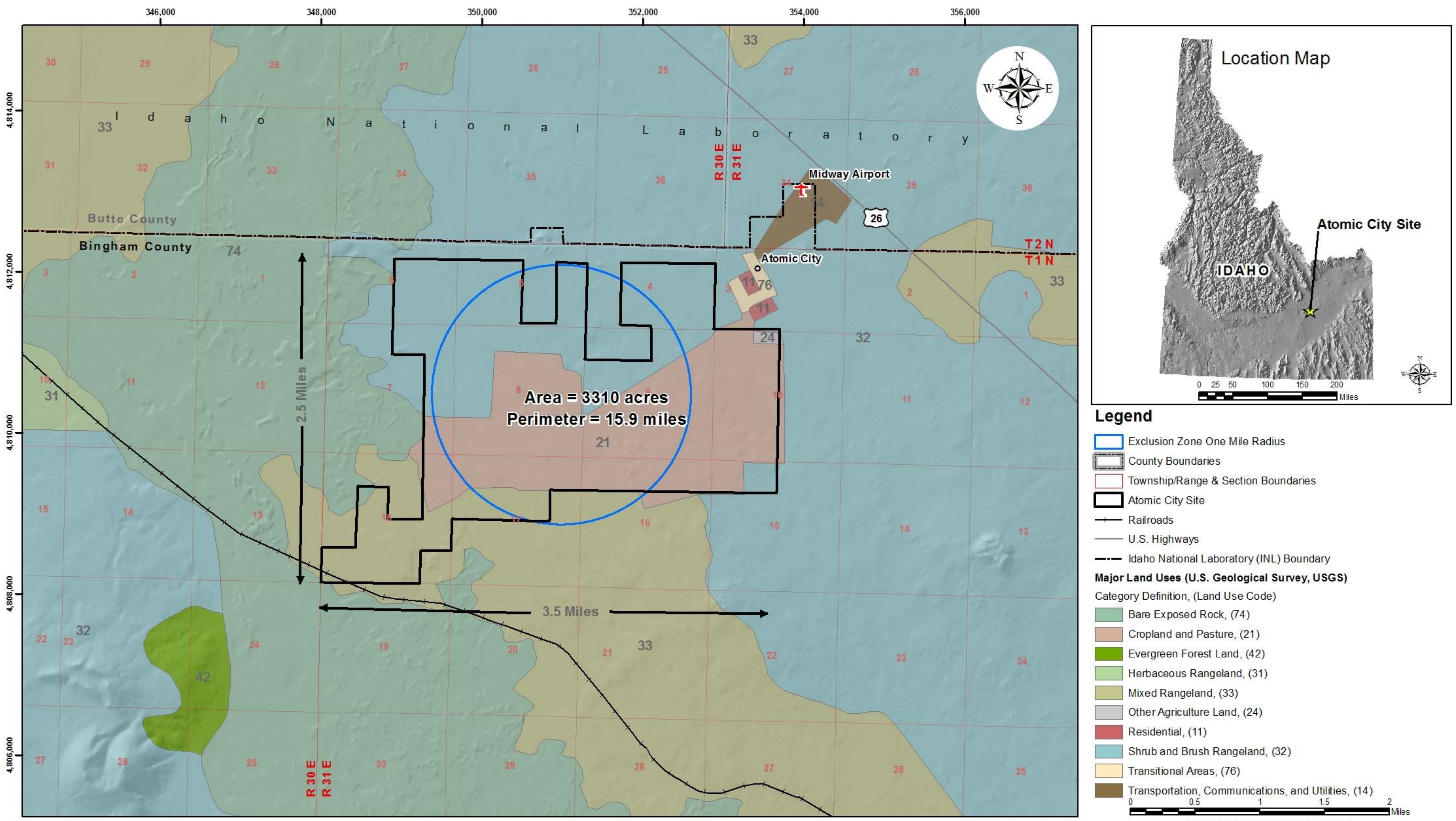

Figure 1-4. Atomic City site linear perimeter dimensions, land use type, and exclusion zone (1-005, 1-009, 1-012, 1-013, 1-015, 1-017, 1-019, 1-043, 1-047, 1-055, 1-059, 1-065).

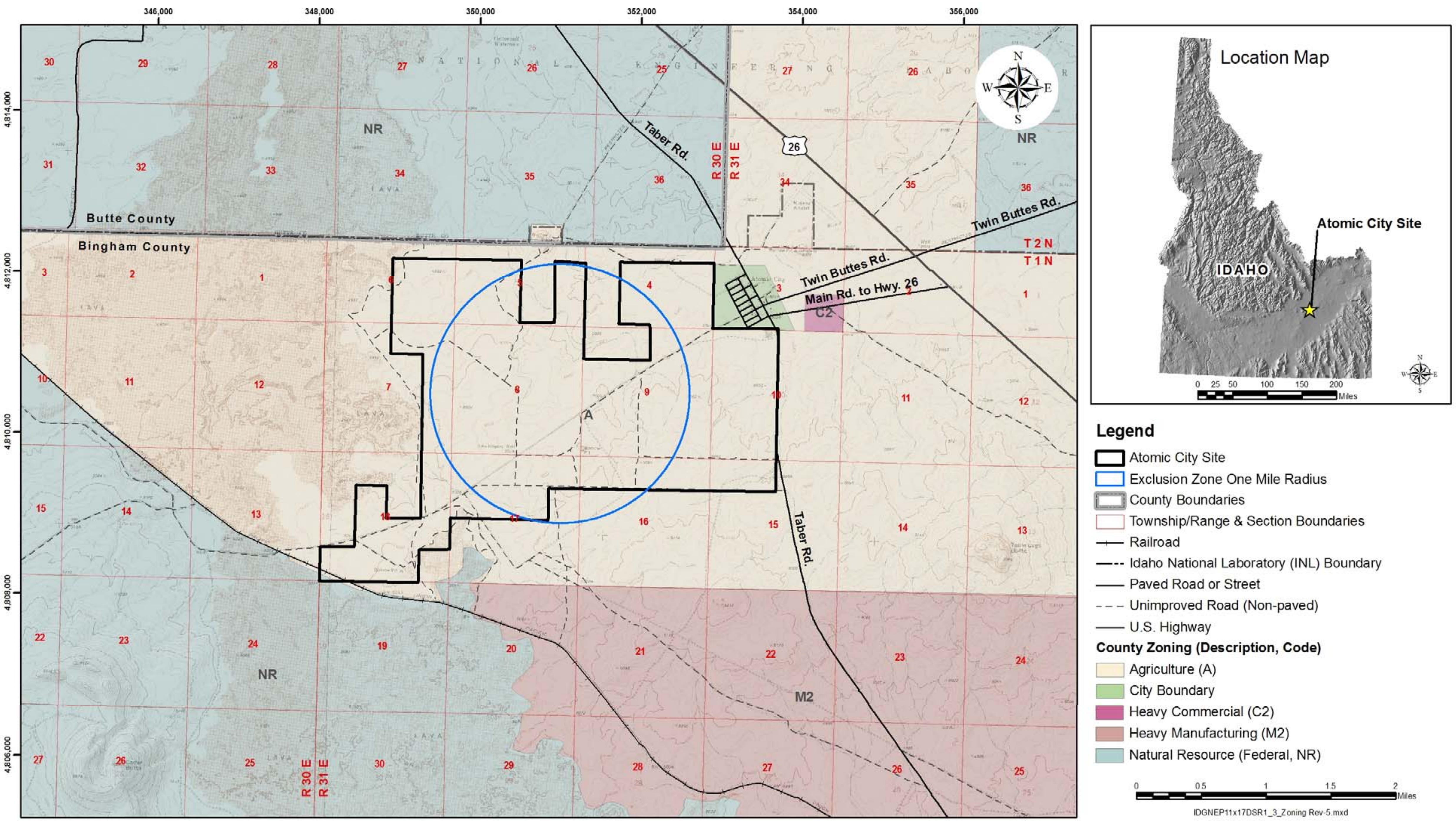

Figure 1-5. Current Atomic City site zoning and transportation routes (local highway, improved and unimproved roads) (1-005, 1-012, 1-013, 1-015, 1-017, 1-035, 1-043, 1-047, 1-055, 1-056, 1-059, 1-061, 1-065).

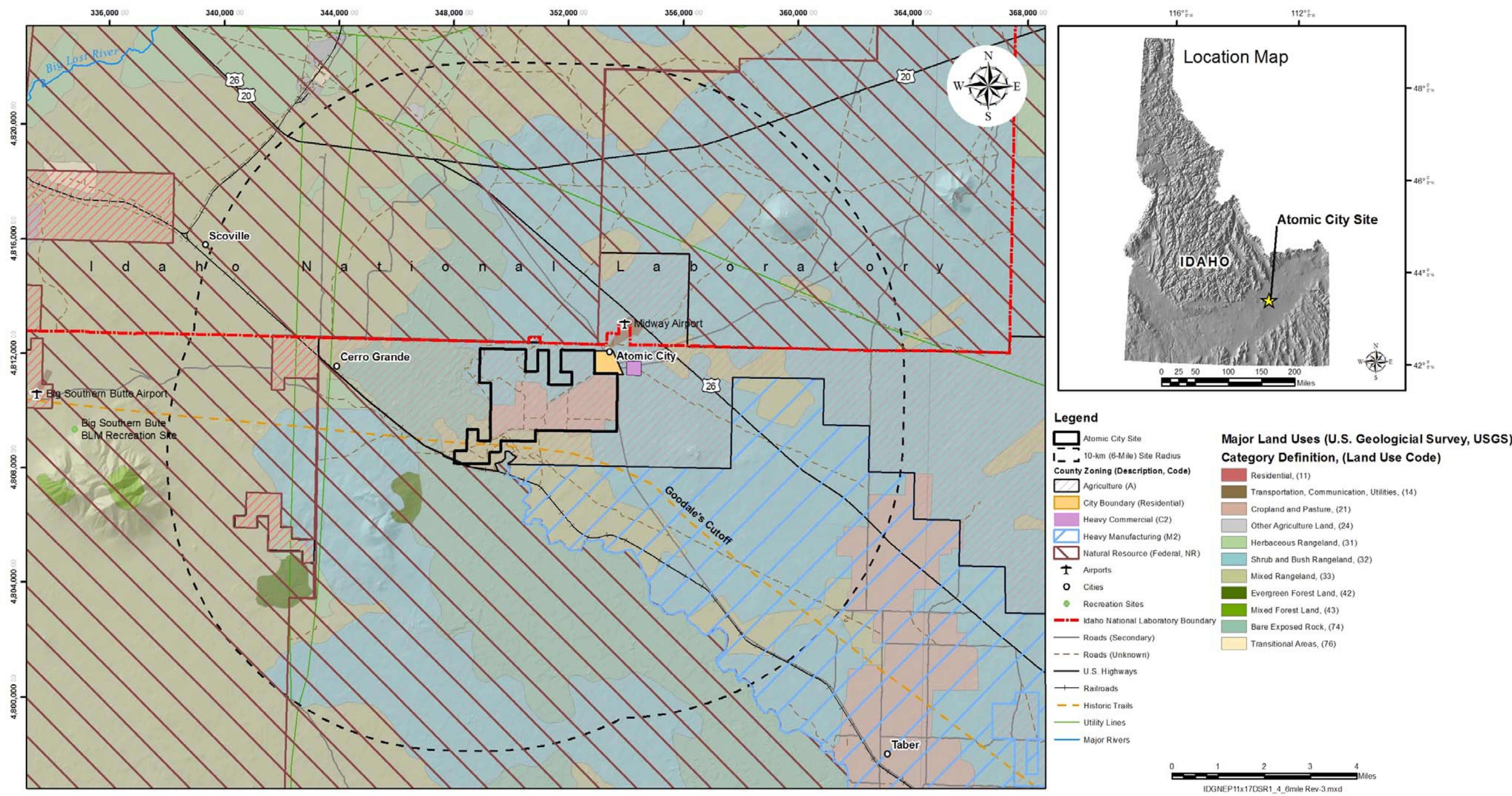

Figure 1-6. Required Atomic City site characteristics located within the 10-kilometer (6-mile) radius (1-003, 1-005, 1-009, 1-010, 1-015, 1-016, 1-017, 1-019, 1-025, 1-026, 1-043, 1-047, 1-050, 1-055, 1-056, 1-058, 1-061, 1-065).

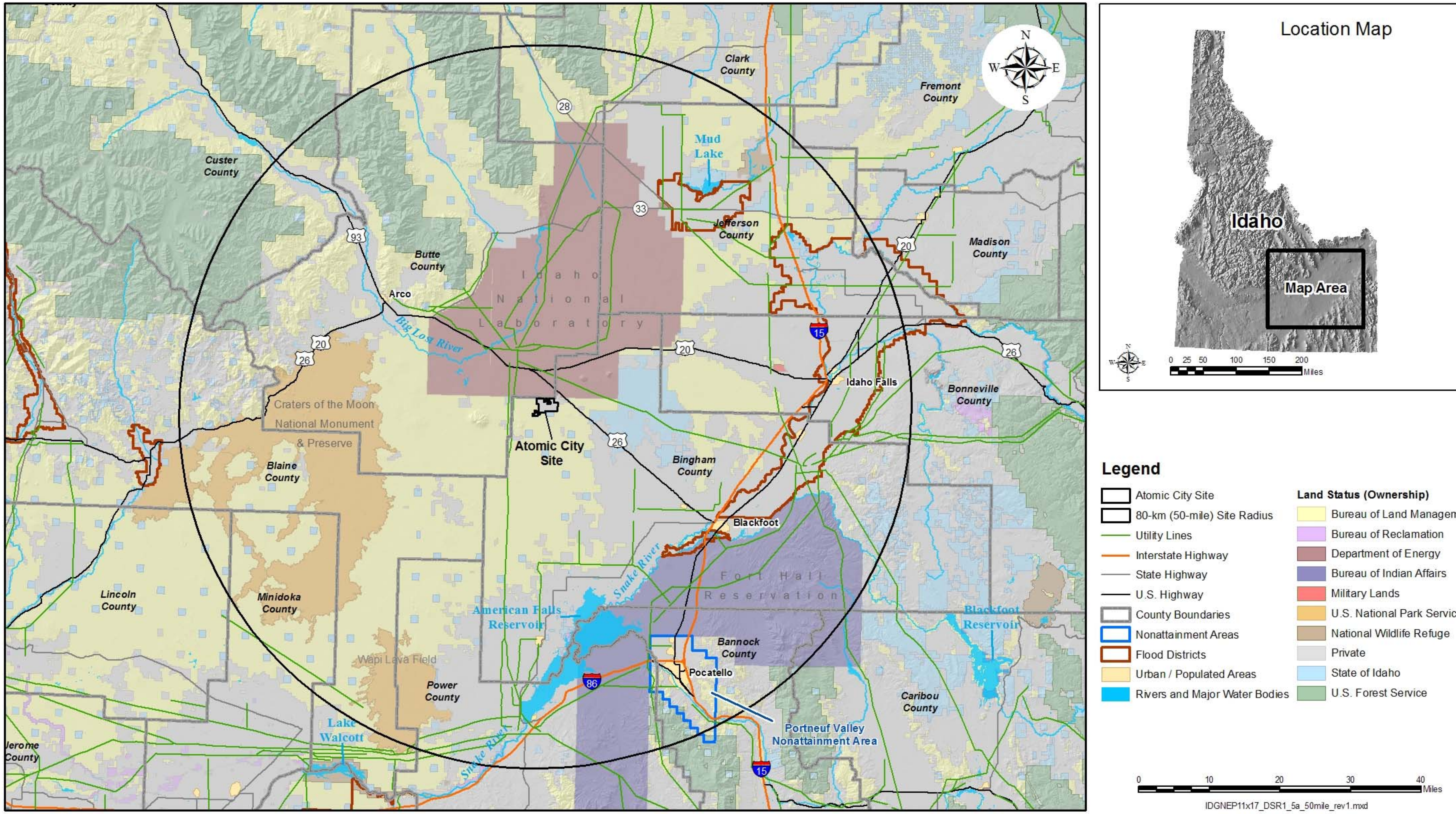

Figure 1-7. Required Atomic City site characteristics located within the 80-kilometer (50-mile) radius (1-005, 1-008, 1-011, 1-017, 1-022, 1-024, 1-036, 1-047, 1-050, 1-055, 1-057) .

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CONTENTS

FIGURES

2. AQUATIC AND RIPARIAN ECOLOGICAL COMMUNITIES

This section describes aquatic and riparian ecological communities that occur within or are near the Atomic City site that have the potential to be disturbed by construction and operation of the GNEP facilities. More detailed information on general plant and animal communities that occur at the site is provided in Section 4, *Critical and Important Terrestrial Habitats*. Special status species (i.e., species covered under the Endangered Species Act [ESA] or of special concern to other federal, state, or local agencies), including any aquatic or riparian habitat-related species, are discussed in Section 5, *Threatened or Endangered and Special Concern Species*. More detailed surface water hydrology information about the site is presented in Section 11, *Hydrology/Flooding*. Section 1, *Maps*, provides a description of the area and Section 10, *Weather/Climatology*, provides a more detailed description of the climate of the area. The base information for maps presented in this section originates from the Section 1 maps. Overlay map data associated with the specifics of this section will be referenced as appropriate.

2.1 Overview and Summary

The Atomic City site proposed for construction of the GNEP facilities is at a remote location that has no fish or shellfish present due to a lack of surface water at or near the Atomic City site. Nevertheless, important habitat areas surrounding this site have been addressed in sufficient detail to allow for the proposed environmental reviews. This information represents the best available data to support analysis of potential environmental impact of constructing and operating the proposed GNEP facilities.

Review of the aquatic and riparian communities surrounding the Atomic City site led to the conclusions that:

- The nearest live water is approximately 25 miles southeast at the Snake River.
- There is no aquatic or riparian vegetation present in the Atomic City site.
- Due to the dry climate and lack of perennial surface water within the Atomic City site, there are no riparian ecological communities present.
- A number of aquatic, riparian, or wetland communities exist within a 50-mile radius of the Atomic City site and are discussed within this section.
- There are man-made impoundments located at the nearby INL that are used for water evaporation and livestock watering impoundments can be found across BLM-managed lands.

2.2 Background

The aquatic and riparian community evaluation has three focal points: 1) research and review of existing literature and information sources to identify any previously described aquatic communities, including fish and shellfish, commercial and sport fisheries, and riparian communities at or near the Atomic City site; 2) research and review of applicable laws and regulations; and 3) a detailed field survey to ground-truth data and information resulting from the background research. The following subsections provide the technical context of aquatic and riparian communities, the regulatory framework, and the results of the literature search and field survey.

2.2.1 Literature Review

To quantify the presence or absence of aquatic and riparian communities within the Atomic City site, a number of databases, documents, maps, manuals, existing literature, and pertinent regulations were examined. An aquatic ecological community contains species “Living or growing in, on, or near the water” (2-021). The word “riparian” describes the bank of a body of flowing water and includes the land adjacent to a river or stream that is influenced, at least periodically, by flooding. A riparian ecosystem is supported by a high water table due to the proximity to an aquatic ecosystem such as a stream or river (2-027). The U.S. Army Corps of Engineers (USACE) 1987 Corps of Engineers Wetland Delineation Manual (1987 Manual) (2-006) defines wetlands as “Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions.” Ephemeral or intermittent streams are much more common in arid landscapes than are aquatic, riparian, and wetland ecological communities. Ephemeral streams are those that only last a very short time, such as during spring runoff periods or during extended high rainfall events (2-021). Similarly, intermittent streams are recurrent, may cease for a time, or may only have water in them part of the time (2-021). Both ephemeral and intermittent streams are generally not considered aquatic, riparian, or wetland areas because water flow, availability, and season of availability are not conducive to meeting the requirements of aquatic, riparian, or wetland systems.

The Clean Water Act (CWA), Section 404 (2-033) requires wetland identification, delineation, and protection if wetlands could be impacted by a proposed action. Most wetlands are considered to be jurisdictional and, as such, are subject to permitting requirements under the jurisdiction of the USACE. The 1987 Manual requires the presence of three parameters in order to designate an area a wetland. These parameters are:

- Hydrophytic vegetation,
- Hydric soils, and
- Hydrology (2-006).

The December 2006 Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (the Supplement) (2-002) contains a new delineation form, procedures, and criteria that are now mandatory for compliance with permitting requirements. The Supplement was utilized to determine presence or absence of wetlands within the Atomic City site.

Prior to conducting field surveys, aerial photographs and topographic maps were reviewed for possible locations of aquatic and riparian ecological communities. The U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) online mapper (2-016) was consulted to help identify if aquatic, riparian, or wetland areas might be found within the Atomic City site. Hardcopy NWI maps of the Atomic City, Middle Butte, Lava Lake Reservoir, Scoville, and Circular Butte quadrangles were obtained from the NWI website designated vendor for Idaho maps. NWI maps are superimposed on USGS 7.5 minute topographic maps. These five blue-line maps were reviewed for wetland locations. The Atomic City and Scoville maps were also reviewed for presence of water courses at the Atomic City site (2-019).

The Natural Resources Conservation Service (NRCS) databases were searched for evidence linking the Atomic City site with the presence of aquatic and riparian indicative soil type and associated range (2-026).

The Safe Drinking Water Act (SDWA) (2-034) was enacted in 1974 to establish minimum national standards for public water supply systems (see Section 12, *Regulatory and Permitting*, for further detail). The SDWA requires protection of sole source aquifers (SSA). The Eastern Snake River Plain (ESRP) SSA map was reviewed (2-025) to determine the spatial relationship between the Atomic City site and the SSA.

2.2.2 Field Survey Methodology

A field survey to collect site-specific information about aquatic and riparian ecological communities at the site was conducted from February 14 to 16, 2007. A crew of six, which included botanists and wildlife biologists, conducted the survey. The survey was conducted by walking parallel transects at 30-meter intervals across the entire project area of 3,310 acres. As mentioned previously, the Supplement (2-002) was used during the field survey to determine presence or absence of wetlands within the project area.

2.3 Results

This section discusses the results of the literature review and field survey. Significant aquatic, riparian, and wetland areas within approximately 50 miles of the Atomic City site are also discussed.

2.3.1 Literature Review Results

The maps and photos of the Atomic City site that were reviewed prior to the field survey indicated that the site had previously been cultivated and irrigated using center pivots and other methods. Two groundwater supply wells are located within the Atomic City site boundary; these are known as the “Leo Rogers-1” and “Leo Rogers-2” wells (see Section 3, *Water Resources*, for more information). It was assumed that leaks in the old irrigation system or around the wells or from any livestock watering sites might be able to support some wetland habitat; therefore, special attention was given to these areas during the field survey to determine if the three wetland parameters— hydrophytic vegetation, hydrology and soils—were present. Review of the USGS 7.5 minute topographic maps identified several small ephemeral streams within the Atomic City site that could contain water after storm events or during snowmelt. Therefore, these potential watercourse areas were also examined carefully during the field survey (2-004).

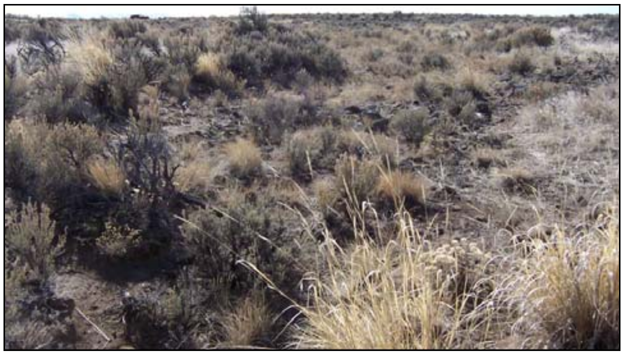
Review of the five NWI maps listed in Section 2.2.1 did not indicate any wetlands within or adjacent to the Atomic City site. No rivers, perennial streams, or springs were identified within the Atomic City site. The nearest live water is approximately 25 miles southeast at the Snake River. NRCS databases were examined for resident soil types and their associated range (2-026). It was determined that the site was an ARTRW8/PSSP6 ecological site. The soil at the Atomic City site is derived from the surrounding mountains and is classified by NRCS as Atom silt loam, Coffee silt loam, Coffee-Nargon-Atom, Lava Flows-Pingree, Nargon-Deuce-Lava Flows, and Pancheri-Polatis complex soil series (Map Unit Symbols 2, 14, 16, 58, 77, and 87 respectively). These soils are moderately extensive in southeast Idaho and primarily support range and wildlife habitat (2-026). They are not included on the Hydric Soils List for Bingham County because they are well drained (2-024).

Average annual precipitation in the area is approximately 9 inches (see Section 10, *Weather/Climatology*, for further details). Summers are generally hot with precipitation mainly from thunderstorms, but the majority of the annual precipitation comes in the winter in the form of snow (2-026). Native vegetation in the area is primarily Wyoming big sagebrush (*Artemisia tridentata wyomingensis*) and bluebunch wheatgrass (*Pseudoroegneria spicata*). Other native species that could be found include Sandberg bluegrass (*Poa secunda*), Thurber's needlegrass (*Achnatherum thurberianum*), Indian ricegrass (*Achnatherum hymenoides*), longleaf hawksbeard (*Crepis acuminata*), needle and thread grass (*Hespero stipa comata*), threetip sagebrush (*Artemisia tripartitea*), bottlebrush squirreltail (*Elymus elymoides*), Nevada bluegrass (*Poa* nevadensis.), antelope bitterbrush (*Purshia tridentata*), rabbitbrush (*Ericameria nauseosa*), and phlox (*Phlox* spp.). None of these plants are known to be aquatic or riparian species (2-014, 2-015).

The Atomic City site is underlain by the Snake River Plain Aquifer, designated as a SSA under the authority of Section 1424(e) of the SDWA (PL 93-523) in 1991 (2-025). The aquifer provides the sole source of drinking water for nearly 200,000 people in southeast and south central Idaho. More detailed information concerning the SSA can be found in Section 3, *Water Resources*. Based on well depths, the aquifer is approximately 600 feet below land surface at the Atomic City site (2-032).

2.3.2 Field Survey Results

No aquatic, riparian, or wetland areas were encountered within the boundaries of the Atomic City site during the February 2007 field survey. No source water bodies capable of supporting fish or shellfish communities are present within the boundaries of the Atomic City site. The small ephemeral streams identified on the topographic maps were examined. Water was not present in these areas during the field survey nor was the vegetation different from the surrounding areas. There was no aquatic or riparian vegetation present in or around the ephemeral streams.



Typical ephemeral stream drainages within the Atomic City site.

There was no evidence of aquatic, riparian, or wetland ecological communities in areas surrounding the two wells, the center pivot locations, or any of the scattered livestock watering sites.


Former irrigation facilities within the Atomic City site.

Agricultural practices, grazing, and wildland fire have caused degradation, fragmentation, and loss of the native shrub steppe habitat that surrounds the site. Very little of the native vegetation, as described in NRCS range site descriptions, remains on the Atomic City site (2-004). The majority of the habitat is a crested wheatgrass (*Agropyron cristatum*) and cheatgrass (*Bromus tectorum*) community. Neither of these species is associated with aquatic or riparian communities (2-032). For further information regarding vegetation communities at the Atomic City site, see Section 4, *Critical and Important Terrestrial Habitats*.

Given the time of year during which the survey was completed, identification of plants (especially grasses and forbs) was largely dependent upon senescent plant material and standing litter. Although some plants were unidentifiable to the species level due to the season, the available data are sufficient to document the absence of perennial aquatic habitat, which eliminates the potential for the presence of aquatic species. Due to the dry climate and lack of perennial surface water, there are no riparian ecological communities present within the site boundaries (2-004).

2.3.3 Nearest Aquatic and Riparian Communities

A number of aquatic, riparian, or wetland communities exist within a 50-mile radius of the Atomic City site. Although these areas do not show any surface water connectivity to the Atomic City site and will not be affected by project consumptive water use, they are described below. These areas are shown on Figure 2-1.

2.3.3.1 Springs

The closest springs are located at Big Southern Butte, approximately 10 miles southwest of the Atomic City site (2-032). There are two springs at this location—Frenchman's Spring, which is privately owned, and Webb Spring, which is maintained by the BLM (2-010). The springs that surface near Springfield, Idaho, approximately 26 miles south of the Atomic City site, are part of the Snake River Plain Aquifer. The flow that feeds these springs is not part of aquifer flow under the Atomic City site (see Section 3, *Water Resources*, for more information).

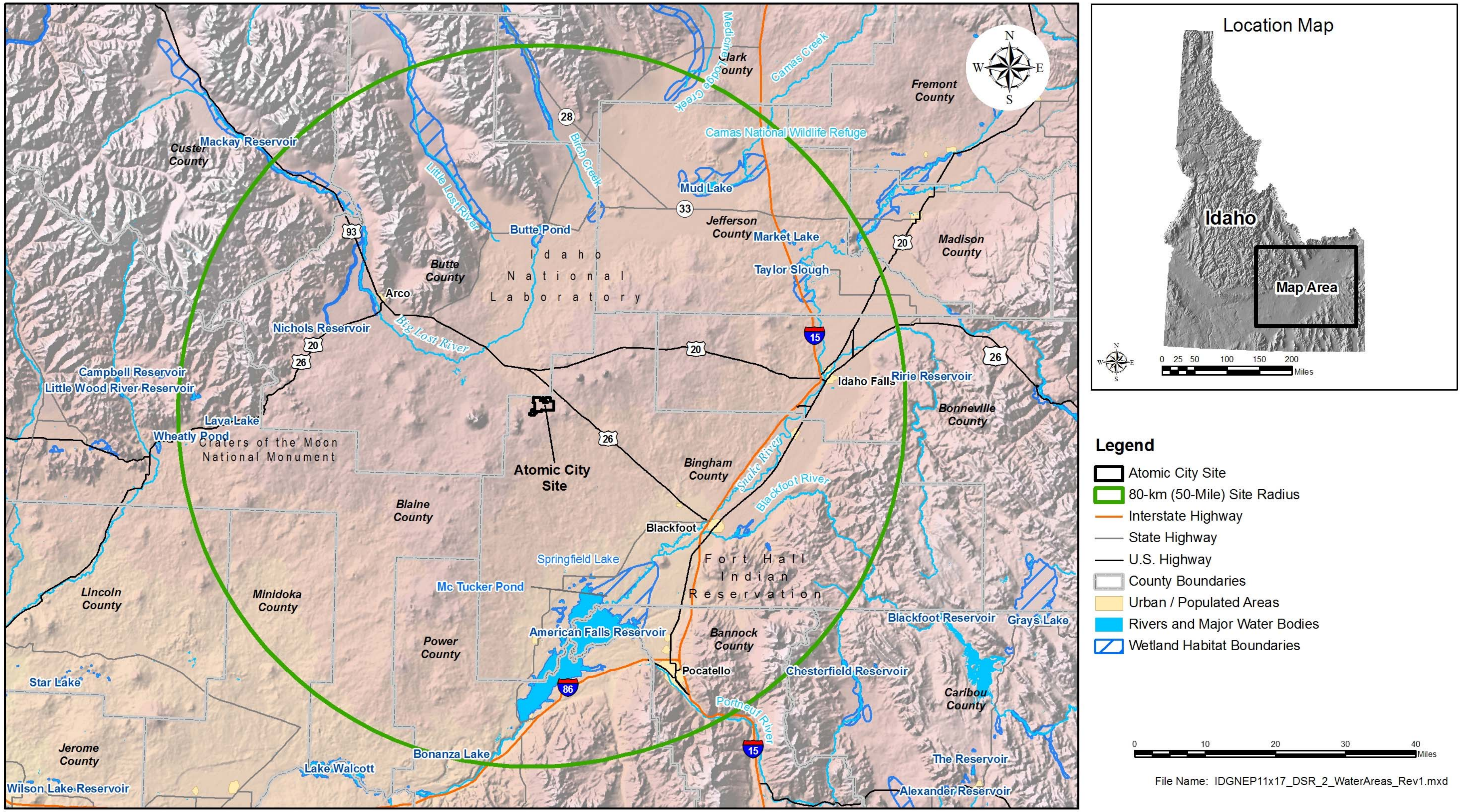


Figure 2-1. Aquatic communities within a 50-mile radius of the Atomic City site (2-007, 2-010, 2-020, 2-023, 2-030, 2-032).

2.3.3.2 Big Lost River

The Big Lost River channel crosses U.S. Highway 20/U.S. Highway 26 approximately 12 miles northwest of the Atomic City site. The river has an intermittent flow, and there have been several years with no flow (2-017). The Big Lost River, Little Lost River, and Birch Creek all converge approximately 22 miles north of the Atomic City site where they form a series of ephemeral playas near State Highway 33. The water infiltrates into the ground and emerges as part of the Thousand Springs complex northwest of Twin Falls, Idaho, 110 miles southwest of the Atomic City site (2-032).

2.3.3.3 Snake River

The Snake River, located approximately 25 miles southeast of the Atomic City site, is the closest significant perennial water body. The Snake River is more than 1,000 miles long and is the main tributary to the Columbia River. It originates near the Continental Divide in Yellowstone National Park, Wyoming, and flows into the Columbia River in Washington State, draining more than 100,000 square miles of land. The Snake River fills the American Falls Reservoir near Springfield. The river is used for a variety of outdoor activities, including fishing and boating (2-030).

2.3.3.4 American Falls Reservoir

The Bureau of Reclamation (BOR) owns and operates the American Falls Dam and Reservoir 46 and 25 miles (respectively) south of the Atomic City site. The dam's hydroelectric facilities are owned and operated by Idaho Power. The dam impounds the Snake River starting at American Falls, with the reservoir extending upstream to south of Springfield (2-020).

The American Falls Reservoir is the second largest reservoir in Idaho. Recreation activities include sailing, water skiing, windsurfing, swimming, boating, and fishing. Idaho Power has stocked the reservoir since 1981. Eight thousand pounds of rainbow trout are released annually into the reservoir to improve the trout fishery. The American Falls Reservoir area is an excellent bird viewing location. Geese and ducks abound, especially during their annual migration, and it is a popular wintering area for bald eagles and white pelicans (2-020).

2.3.3.5 Springfield Lake

Springfield Lake is located just south and west of the city of Blackfoot, about 26 miles south of the Atomic City site. It is fed by springs from the Snake River Plain aquifer. The lake supports a wetland complex with aquatic habitat. The associated Springfield Bird Preserve, known as the Springfield Bird Haven, was created to provide protection for wild birds that either migrate through the area or nest on the Preserve. (2-023).

2.3.3.6 McTucker Ponds

The McTucker Ponds are located at the Snake River inlet of American Falls Reservoir, approximately 25 miles from the Atomic City site. These ponds are part of the Idaho Department of Fish and Game (IDFG) Family Fishing Waters. These sites are set up to encourage family fishing. The season is year-round with a limit of six trout and six bass and no creel limit on other species. There are also no length limits or any fishing gear standards (2-012).

2.3.3.7 Other Waters

Approximately 13 miles northwest of Atomic City are low-lying spreading areas constructed for flood control in the 1950s. Seasonal snowmelt and overflow is diverted to these spreading areas from the Big Lost River. There is no surface flow from these spreading areas, and they do not have water in them on a consistent basis.

Within the 50-mile radius of the Atomic City site are several more water bodies. One area includes Camas Creek, 37 miles northeast of the site, Mud Lake at 30 miles northeast, and Camas National Wildlife Refuge (NWR) at 40 miles northeast. Mud Lake is northeast of this complex and is an IDFG Wildlife Management Area (WMA). Mud Lake and Camas NWR provide a stopover area for migratory waterfowl and have some wintering bald eagles. The water levels at Mud Lake are controlled by the irrigation demands of the farmland south and west of the lake. Waste water from irrigation and the water remaining in the lake eventually infiltrate into the Snake River Plain Aquifer. Other than the irrigation canals, there is no surface flow out of Mud Lake.

Market Lake, 40 miles northeast of the Atomic City site, is another IDFG WMA for waterfowl. The furthest flowing water in this area is Medicine Lodge Creek, which infiltrates into the aquifer just north of Mud Lake within the 50-mile radius of the Atomic City site.

Two rivers located southeast of the Atomic City site are tributaries of the Snake River. The Blackfoot River converges with the Snake River 27 miles southeast of the site on the Fort Hall Indian Reservation, near the city of Blackfoot. The Portneuf River begins 47 miles southeast of the Atomic City site, flowing out of the 50-mile radius, and then flows back into the radius and into the Snake River at American Falls Reservoir northwest of the city of Pocatello, approximately 25 miles south of the Atomic City site.

Several man-made impoundments are located within the INL. Small livestock watering impoundments can be found across the BLM managed lands west and south of the site.

The terrain, gradient, and distance from the Atomic City site to any of these surface water features preclude any of these waters from supporting aquatic or riparian ecological communities in the Atomic City site.

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* Indicates those sources considered but not cited.

CONTENTS

FIGURES

TABLES

3. WATER RESOURCES

The Snake River Plain Aquifer would be the most logical water resource for the Atomic City site. It is one of the most productive aquifers in the U.S. (3-032). This aquifer provides a source of drinking water to more than 200,000 people and supplies irrigation water to a large, regional agricultural and aquacultural economy in southeastern Idaho. This section provides a detailed description of the Snake River Plain Aquifer, including hydraulic properties, flow through the aquifer, potential impacts from development of the Atomic City site to wetlands, ground-water and surface-water quality, and water availability.

The information presented in this section of the document is organized such that there is a logical flow from a technical perspective. To ensure clarity relative to the required water resource elements, a cross-walk between required elements and document sections and figures where the information resides is provided in Table 3-1.

Table 3-1. Cross-walk for required water resource elements.

Required Information Element	Section/Figure
Describe aquifers potentially impacted by on-site wells	3.2.1
a. Areal extent	3.2.1.1, 3.2.1.2
b. Thickness	3.2.1.1, 3.2.1.2
c. Porosities, hydraulic conductivities	3.2.1.1, 3.2.1.2
d. Significant uncertainties and inhomogeneities	3.2.1.3
Describe existing and known future off-site and on-site wells	3.2.2
a. Average flow rates	3.2.2.3
b. Peak flow rate	3.2.2.3
c. Water use	3.2.2.1
d. Completion depth	3.2.2.1
Provide maps of steady state piezometric surfaces	3.2.2
a. Wells at peak production	Figure 3-8 and 3-9
b. Wells at average production	Figure 3-7
c. Steady state no pumpage	Figure 3-6
d. Annotate wells according to drawdown contribution	Figure 3-4, Table 3-5
e. Identify and describe method of analysis with assumptions	3.2.2.3
Describe existing and known future ground-water rights (including Native American)	3.4.2
Describe wetlands affected by a lowered water table	3.3.5
Describe potentially affected waters that could receive GNEP facility discharges with classifications	3.2.3, 3.3.3
Describe existing environmental contamination with potential to impact ground-water quality	3.2.3
If a surface-water supply is proposed, state and prove unencumbered proof of water rights	N/A
Describe existing environmental contamination with potential to impact surface-water quality	3.3.4
Describe quantity of ground and surface water supplies available and proximity to site	3.4.1

3.1 Overview and Summary

The Atomic City site is located on the ESRP and lies above the Snake River Plain Aquifer (shown on Figure 3-1), which would provide the only practical source of water for the proposed GNEP facilities. The Snake River Plain Aquifer encompasses an area of approximately 10,800 square miles bounded to the northwest and southeast by the Basin and Range Province and to the northeast by the Yellowstone Plateau (3-012). The aquifer consists primarily of a complex sequence of individual basalt flows, and the capacity of the aquifer is considered relatively high due to the fractured nature of the basalt. The closest major body of surface water is the Snake River, approximately 25 miles to the southeast. American Falls Reservoir lies 25 miles to the south.

A review of the most current information based on readily available and existing literature led to the conclusions that:

- Water for the GNEP facilities could be obtained from on-site wells drilled into the Snake River Plain Aquifer. The aquifer is highly productive and provides a source of water to a large regional agricultural and aquaculture economy in southeastern Idaho and is not expected to be adversely affected by the GNEP facilities.

- Wells installed within the vicinity of the Atomic City site include INL monitoring wells and local wells for domestic use, livestock, and irrigation. A grant for a new public supply well has been issued to the community of Atomic City.

- The ground-water right for the Atomic City site is the subject of a partial decree entered into the Snake River Basin Adjudication. There are no issues with known or future ground-water rights, including Native American tribal ground-water rights associated with the project wells.

- Ground-water extraction from the Snake River Plain Aquifer would not adversely affect any wetlands or aquatic/riparian communities within or near the Atomic City site because no wetlands occur on or near the site and because of the large depth to ground water.

- No surface water or ground water would be adversely affected by discharges from the Atomic City site. The Atomic City site is not located near any surface waters.

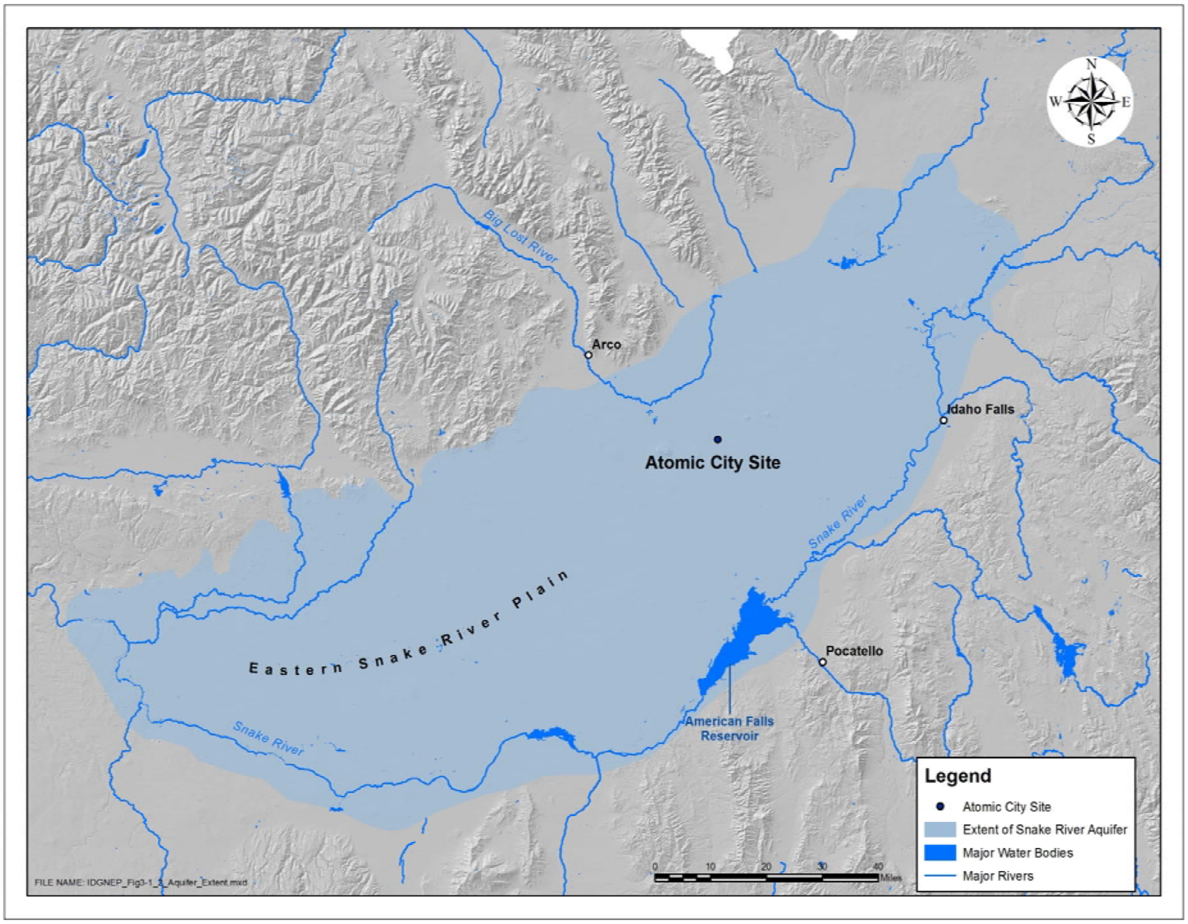

Figure 3-1. Location of the Atomic City site with respect to the Snake River Plain Aquifer, Snake River, and other surface-water features (3-004).

3.2 Ground-Water Resources

The Snake River Plain Aquifer is the primary ground water resource for the ESRP. Subsequent sections describe regional and local (Atomic City site) hydrogeologic systems that define the Snake River Plain Aquifer, the quantity of available ground water and projected affect of withdrawals on nearby wells, and the chemical quality of ground water and potential for contamination.

3.2.1 Hydrogeologic Systems

Hydrogeologic systems within the ESRP are defined as those geologic features that control the occurrence and movement of ground water. Subsequent sections describe the regional hydrogeologic setting and occurrence of ground water in the vicinity of the Atomic City site.

3.2.1.1 Regional Hydrogeologic Setting

The Snake River Plain Aquifer underlies the ESRP, an area of approximately 10,800 square miles, bounded to the northwest and southeast by the Basin and Range Province and to the northeast by the Yellowstone Plateau (Figure 3-2). The Snake River Plain Aquifer consists primarily of a complex sequence of layered basalt flows with intervening sedimentary interbeds in places (3-031). The occurrence and movement of water in the regional aquifer system that underlies the plain depends on the aquifer extent and thickness, hydraulic properties of the rocks that compose the geologic framework, and on the distribution and amount of ground-water flow within that framework.

The active thickness of the Snake River Plain Aquifer, defined as that thickness through which most water moves, was estimated by Robertson (3-035) to average 250 feet throughout the region. Garabedian (3-012) noted that the thickness is largely unknown, but geophysical studies indicate that the Quaternary basalt may exceed several thousand feet in places (3-003, 3-034). More recent USGS studies (3-036) have estimated the active thickness in the eastern half of the INL to be as much as 2,500 feet. The INL Operable Unit (OU) 10-08 ground water model (3-029, 3-031) provided thickness estimates ranging from less than 500 to more than 1,300 feet in the region encompassing the INL and surrounding areas.

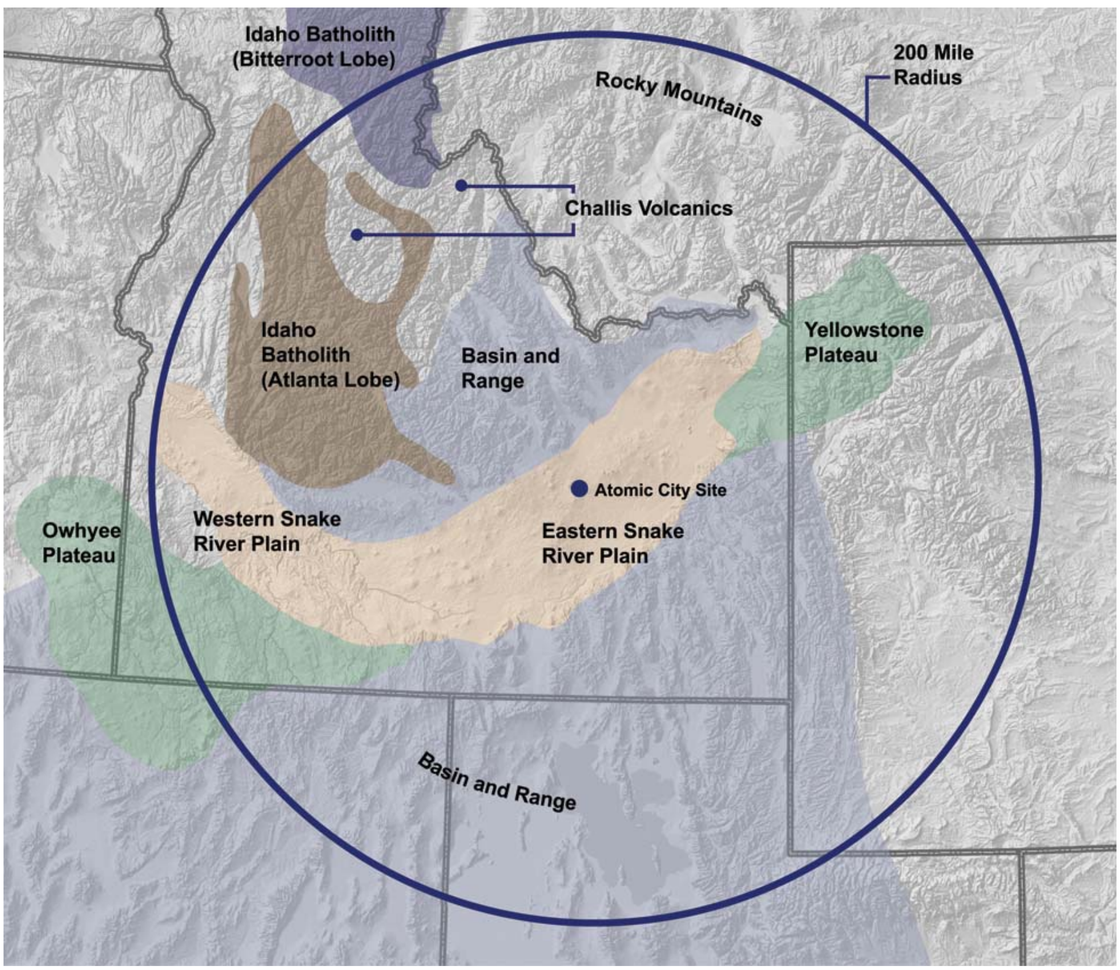

Figure 3-2. Location of the eastern Snake River Plain, Yellowstone Plateau, and Basin and Range Province, southeastern Idaho (3-029).

The architecture of a typical basalt flow is characterized by a broken, rubbly, and vesicular upper surface, massive, unfractured basalt-flow interior, and fractured flow base (Figure 3-3). The Snake River Plain Aquifer consists of a thick, complex sequence of individual basalt flows. The interval between individual basalt flows in this sequence is called an interflow zone, and is characterized by large permeability. Most ground-water flow within the aquifer occurs within the complex network of interflow zones throughout the stratigraphic sequence (3-031). Ground-water flow is anisotropic, and horizontal permeability greatly exceeds vertical permeability. Where present, sedimentary interbeds within the stratigraphic sequence reduce aquifer permeability.

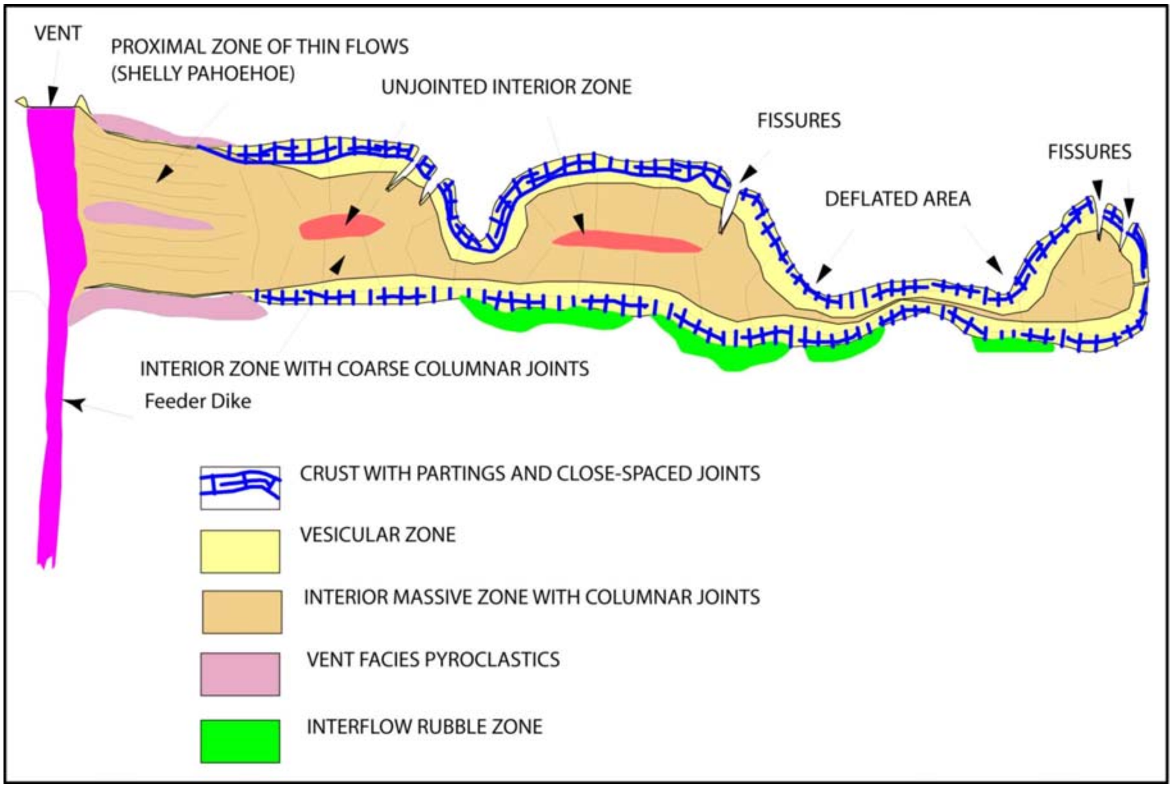

Figure 3-3. Architecture of an individual basalt flow within the Snake River Plain Aquifer (adapted from 3-037).

Hydraulic Properties

The high productivity of the Snake River Plain Aquifer is attributed to hydraulic properties (porosity and hydraulic conductivity) that define the capability of water-bearing materials to store and transmit water (3-031). Porosity is the ratio of the total volume of voids of a given porous medium to the total volume of the porous medium, and normally is expressed as a percentage. Porosity of basalts, estimated from core samples, ranges from 0.05 to 0.27 (3-036). The storage coefficient commonly is used to describe the capacity of the Snake River Plain Aquifer to store and release water. The storage coefficient is defined as the volume of water released from or taken into storage in a unit volume of aquifer in response to a unit change in head. Robertson (3-035) estimated the unconfined storage coefficient for the Snake River Plain Aquifer to be 0.10. Garabedian (3-012), in development of a numerical model of regional ground-water flow, used a storage coefficient that ranged from 0.05 for basalt (3-039) to 0.20 for sediments. A wide range of effective porosity estimates (0.03 to 0.25) have been estimated by other researchers.

The largest volumes of water are in storage within the high permeability interflow zones; the ratio of interconnected void space available for fluid transmission within these zones likely is represented by the upper end of the range of effective porosity estimates. This factor contributes to the high productivity of the Snake River Plain Aquifer.

The hydraulic conductivity is the capability of an aquifer to transmit ground water at the prevailing viscosity through a cross section of unit area under a unit hydraulic gradient through a unit length in flow. The hydraulic conductivity of the Snake River Plain Aquifer is controlled primarily by the thickness of individual basalt flows and the corresponding number of highly permeable interflow zones, and by the occurrence of sedimentary interbeds that reduce permeability (3-031). The complex stratigraphic sequence, distribution of basalt flows, and localized basalt-flow features result in extreme local heterogeneity in hydraulic conductivity. Hydraulic conductivity estimates in 114 wells at or near the INL ranged over six orders of magnitude (.01 to 32,000 feet per day) (3-006).

Ground-Water Flow System

Recharge to the Snake River Plain Aquifer is derived from seepage of surface water used for irrigation, stream and canal losses, underflow from tributary drainage basins, and infiltration of precipitation (3-012). Based on the regional ground-water budget compiled by Garabedian, recharge to the Snake River Plain Aquifer during 1980 totaled 8 million acre-feet of water. Garabedian noted that 1980 fluxes were assumed to approximate average annual fluxes during 1950-80. Based on this assumption, the volume of recharge estimated to occur during 1980 is generally believed to be representative of normal recharge to the aquifer.

Recharge from surface-water irrigation was estimated from Garabedian’s water budget for the Snake River Plain Aquifer (3-012) to constitute 60 percent of the total recharge component. Water infiltrating from stream channels and canals constituted a total of 13.4 percent of total recharge; Snake River losses constituted 8.6 percent and other streams and canals totaled 4.8 percent. Mountainous tributary basins contain basinal aquifers with ground-water flow moving as underflow into the Snake River Plain Aquifer. Based on Garabedian’s water budget, underflow from ground water basins tributary to the Snake River Plain Aquifer constituted almost 18 percent of total recharge. Infiltration from tributary streams and associated canal systems was estimated by Garabedian to be almost 5 percent of recharge. Recent estimates (3-031) of recharge from precipitation range from 2 to 5 percent of total precipitation. This source of recharge is distributed over the plain and likely does not constitute a major source of recharge to the Snake River Plain Aquifer.

Figure 3-4 (3-032) illustrates the extent of the Snake River Plain Aquifer, potentiometric contours delineating the altitude of the water table in 1980, and ground-water flow paths. The potentiometric surface map, constructed from contoured well water-level data, indicates that regional ground-water flow within the Snake River Plain Aquifer, shown on Figure 3-4, is from the northeast to the southwest. Ground water moves horizontally through highly fractured and rubbly interflow zones between Quaternary basalt flows of the Snake River Group.

Garabedian (3-012) observed that regional discharge from the Snake River Plain Aquifer occurs largely as spring flow to the Snake River and as water pumped for irrigation. Major springs are located near American Falls Reservoir and along the Snake River from Milner Dam to King Hill (red arrow points located on the north side of the reservoir and in the southwest part of the ESRP, Figure 3-4). Garabedian estimated that 1980 discharge to the Snake River from these major springs constituted more than 86 percent of water discharged from the Snake River Plain Aquifer.

Spring discharge has diminished since 1980 in response to water management practices on the ESRP. These changes included a transition from flood to sprinkler irrigation and increased ground water withdrawals for irrigation. Cosgrove et al. (3-038) determined that springflows decreased from 6,110 to 5,440 cubic feet per second during 1980-2002. However, aquifer discharge from springflow remains the largest discharge volume. Ground-water discharge from irrigation pumpage was estimated to be approximately 14 percent of total aquifer discharge.

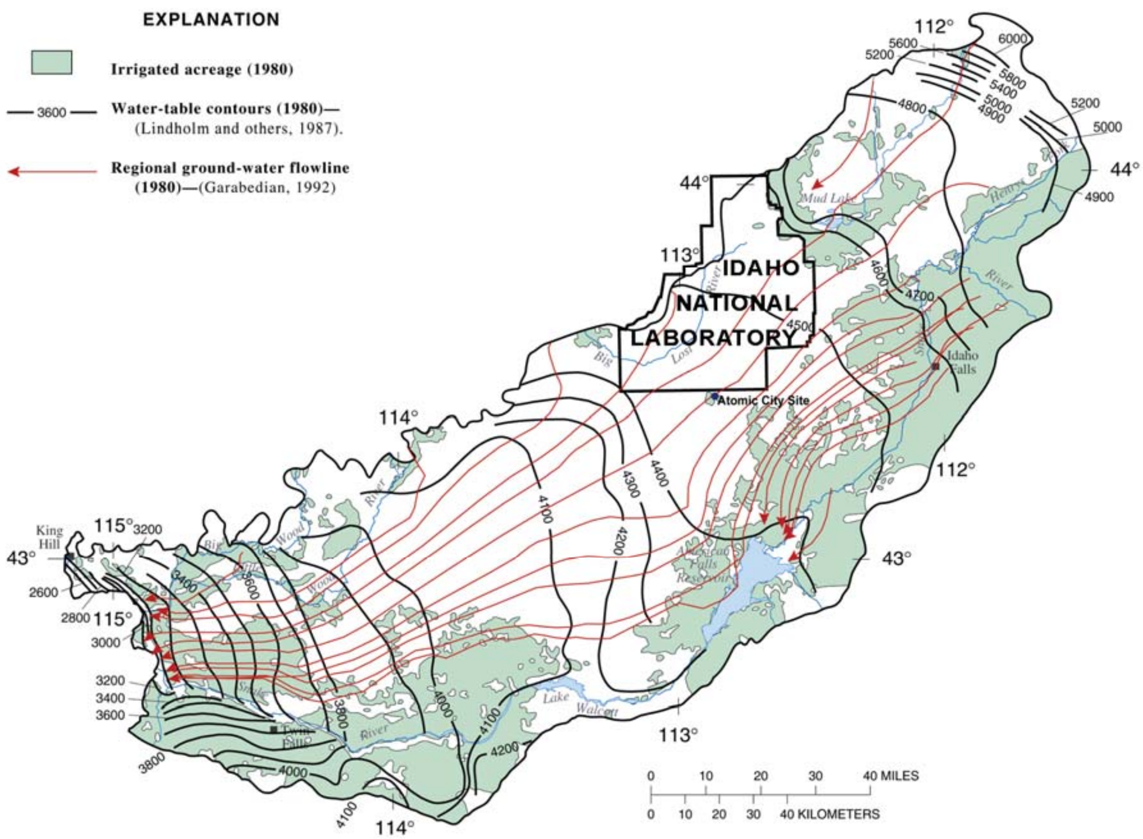

Figure 3-4. Extent of the Snake River Plain Aquifer, showing the 1980 potentiometric surface (black contours) and flow lines (red arrows). (Modified from 3-032, Figure 1-2).

3.2.1.2 Aquifers beneath the Atomic City Site

The Atomic City site is located in the central part of the ESRP (Figure 3-1). The Snake River Plain Aquifer is the only ground water resource that could provide a source of water to the Atomic City site or could be impacted by wastewater disposal from the site. In the vicinity of the Atomic City site, the stratigraphic sequence consists primarily of layered basalts (3-033). This sequence includes a thick vadose zone and the Snake River Plain Aquifer.

Based on water-level data, the vadose zone (zone of unsaturated rocks above the water table) at Atomic City is approximately 600 feet thick (3-008). This zone consists largely of layered basalt flows typical of the axial volcanic zone. Geophysical logs (3-033) indicate that only one 10- to 20-foot thick interbed occurs in the penetrated basalt section within the vadose zone.

The top of the Snake River Plain Aquifer in the vicinity of the Atomic City site, as defined by water-level measurements, lies between 4,411 and 4,457 feet above sea level (3-008). The active thickness of the aquifer at the Atomic City site, as derived from thickness maps, is estimated to range from approximately 650 to 1,150 feet (3-029).

Local Distribution of Hydraulic Properties

Table 3-2, derived from aquifer test analyses at the INL (3-006, 3-045), lists hydraulic conductivity estimates from wells near the Atomic City site. The Atomic City site is located on the Axial Volcanic Zone, and the stratigraphic sequence is similar to those penetrated by wells at Experimental Breeder Reactor (EBR) II, Auxiliary Reactor Area, and the Large Scale Aquifer Pumping Test (LSAPT) on the INL. Based on this similarity, hydraulic conductivity of the Snake River Plain Aquifer at the Atomic City site is considered to be of the same magnitude as that for production and test wells at those facilities (Table 3-2), ranging from 100 to more than 5,000 feet per day.

Recharge, Ground-Water Flow, and Discharge

The Atomic City site is located far from major sources of recharge to the Snake River Plain Aquifer. The nearest surface-water recharge occurs along the channels of the Big Lost River, 9.5 miles to the northwest, and the Snake River, approximately 25 miles to the southeast (3-031). The nearest area of ground-water underflow to the Atomic City site is approximately 20 miles to the west at the mouth of the Big Lost River valley. In the Atomic City site, precipitation is estimated to be approximately 9 inches annually. Based on recent precipitation recharge estimates for the ESRP, this source of recharge may range from 0.18 to 0.45 inches (2 to 5 percent of this annual total) at the Atomic City site.

Regional ground-water flow in the vicinity of the Atomic City site is to the southwest (Figure 3-4). Based on Garabedian's analysis, ground water beneath the Atomic City site flows southwest approximately 120 miles to discharge to large springs along the Snake River (3-012). The closest ground-water discharge to the Atomic City site is from pumping withdrawals for irrigated farm land 7 to 10 miles to the southeast. This discharge is from ground-water flow paths that are cross-gradient to flow beneath the Atomic City site.

Table 3-2. Specific capacity, transmissivity, and hydraulic conductivity estimates for wells near the Atomic City site (3-036, 3-045).

Well*	Distance (miles)	Direction	Interval (feet)	Test Length (minutes)	Discharge (gpm)	Drawdown (feet)	Specific Capacity (gpm per feet drawdown)	Transmissivity (feet^2 per day)	Hydraulic Conductivity (feet per day)
EBR II-1	12	Northeast	100	2880	1025	0.25	4.10E+03	5.20E+05	5.20E+03
EBR II-2	12	Northeast	100	2850	940	8.06	1.20E+02	1.10E+04	1.10E+02
Arbor Test	12	Northeast	100	1080	403	0.13	3.10E+03	5.60E+05	5.60E+03
Auxiliary Reactor Area (ARA) 2	6	North	108	480	1075	1.38	7.80E+02	1.10E+05	1.02E+03
ARA 3	6	North	640	957	560	0.64	8.80E+02	2.10E+04	3.28E+01
USGS 110	2	West	200	135	4.4	0.04	1.10E+02	1.10E+04	5.50E+01
USGS 14	9	Southwest	37	210	15.9	0.08	2.00E+02	2.20E+04	5.95E+02
LSAPT test well	8	Northwest	242	52099	2800**	9.53	2.94E+02	1.40E+06***	5.79+03

* For well locations, see Figure 3-5.
** Time-weighted average over entire duration of pumping test (36.18 days).
*** Arithmetic mean of transmissivity from all LSAPT well tests.
gpm = gallons per minute.
LSAPT = Large scale aquifer pumping test.

3.2.1.3 Significant Uncertainties and Inhomogeneities

Uncertainties and inhomogeneities affect the characterization of the Snake River Plain Aquifer in the vicinity of the Atomic City site. Significant uncertainties and inhomogeneities include uncertainty about the active thickness of the Snake River Plain Aquifer, uncertainty in the distribution of hydraulic properties, and local inhomogeneities that affect the capacity of the aquifer to store and transmit water.

Aquifer Thickness

The thickness of the active aquifer has not been determined in the area of the Atomic City site. The nearest, fully penetrating wells are located approximately 10 miles to the northwest. The saturated thickness estimates at the Atomic City site are based primarily on surface electrical resistivity data with a large range of uncertainty (3-031). Although the total thickness is not well characterized, the location of the Atomic City site on the Axial Volcanic Zone indicates that the total thickness of active aquifer likely exceeds 650 feet (3-029).

Distribution of Hydraulic Properties

Two USGS monitoring wells near the Atomic City site provided information about hydraulic conductivity. However, these wells were pumped at low rates and are not fully penetrating. Tests in these wells may only sample a small volume of aquifer material and may not be representative of a substantial volume of aquifer. Tests with large pumping rates were available from production wells located at greater distances. These tests sampled a larger volume of aquifer and provided a better estimate of the capability of the Snake River Plain Aquifer to transmit water. Although no large-capacity well data are available at the Atomic City site, the estimates provided from distant wells likely are adequate to estimate the range of hydraulic conductivity because they are located in a similar stratigraphic sequence and because tests in those wells sampled a larger volume of the aquifer (3-006).

Local Inhomogeneities Affecting the Capacity of the Aquifer to Store and Transmit Water

The vertical and horizontal distribution of hydraulic properties within the Snake River Plain Aquifer at the Atomic City site is controlled by the complex stratigraphic sequence of numerous, thin basalt units, with rubbly and fractured interflow zones and massive basalt-flow interiors. Inhomogeneities within this complex sequence commonly result in large ranges of hydraulic properties and aquifer productivity. However, the capability of the aquifer to provide water to wells in the Atomic City area is likely to be substantial based on aquifer test results in adjoining areas (3-006).

3.2.2 Ground-water Quantity

The Snake River Plain Aquifer is capable of yielding large quantities of water to wells. At and near the Atomic City site, wells have been drilled for several purposes. Subsequent sections describe existing and known future on-site and off-site wells, existing conditions within the aquifer, and estimated drawdown associated with pumpage from site wells.

3.2.2.1 Existing and Future On-site and Off-site wells

Evaluation of the capability of the Snake River Plain Aquifer to produce an adequate supply of water requires use of data from existing and known future wells. Subsequent sections describe on-site and off-site wells that have been constructed and summarize planned wells in the vicinity of the Atomic City site. Figure 3-5 shows wells located in the vicinity of the Atomic City site and is based on the map data described in Section 1, *Maps*, in addition to data on well locations obtained for this section.

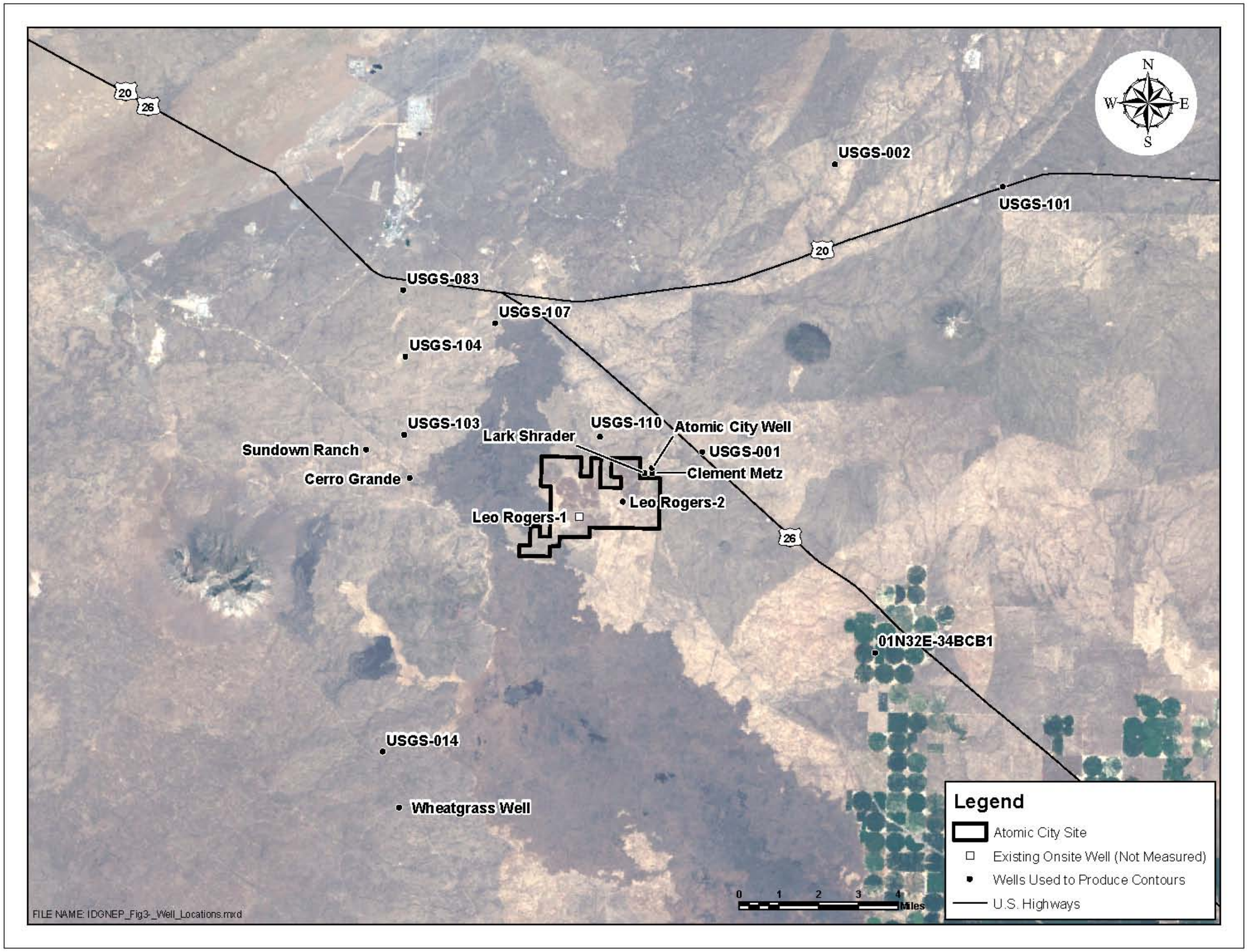

Figure 3-5. Location of on-site and off-site wells in the vicinity of the Atomic City site (3-010, 3-033, 3-040).

On-site Wells

Two supply wells are located within the Atomic City site boundary. These are known as the "Leo Rogers-1" and "Leo Rogers-2" wells (Figure 3-5). The Idaho Department of Water Resources (IDWR) maintains an online database of well information for the state of Idaho, which is available for public use (3-007). This database was queried for both of the Leo Rogers wells. No information on these wells is available in the database. The only information available for the site through the IDWR is the water-right information, which lists the legal description, the source of the water (i.e., ground water), and the seasonal water allotment (3-022).

Actual pumpage data are not available for the Leo Rogers wells. The current water right for the Atomic City site is 483 acre-feet per growing season. This equates to an average combined flow rate of approximately 300 gpm over the course of the calendar year.

The water-right for the Leo Rogers wells identified a maximum diversion rate of 1.89 cubic feet per second (848 gpm). The peak flow rate for each of the two Leo Rogers wells, assuming the full use of the water right, is estimated to be half of the maximum diversion rate, or approximately 424 gpm (Table 3-3). The capability of large-volume wells (LSAPT, EBR II, and ARA wells) ranges from 940 to 2,800 gpm (Table 3-1). The characteristics of the Snake River Plain Aquifer at these sites are similar to those at the Atomic City site. It is likely that a production well at the Atomic City site completed across the total aquifer thickness can produce an equivalent amount of water.

The purpose of the Leo Rogers wells was to provide a supply of irrigation water for agricultural use (3-022). Water was distributed to multiple irrigated fields via a network of pipelines and valves. Currently, the wells are equipped with small-capacity submersible pumps and are used as a source of livestock water.

Publicly available information on the completion of the on-site wells is sparse, probably because these wells are privately owned and were installed some time ago. The information that is available indicates that the Leo Rogers-1 well is 20 inches in diameter and is 702 feet in depth (3-040) (Table 3-3). No other information on this well is available. The general depth to ground water in the area is approximately 600 feet; therefore, the Leo Rogers-1 well intersects at least the upper 100 feet of the Snake River Plain Aquifer. No publicly available information is available for the Leo Rogers-2 well.

Table 3-3. Drilling, location, water-use, and withdrawal information for onsite and offsite wells, Atomic City site (3-033, 3-040, 3-017).

			Location				Pumpage Withdrawal Data		
Well Name	**IDWR Identifier**	**Date Drilled**	**Latitude/Longitude**	**Township Range Section ¼ ¼**	**Total Depth (feet)**	**Water Use**	**Average (gpm)**	**Maximum (gpm)**	**Data Source**
Wells located on the Atomic City site									
Leo Rogers-1	35-2892-A	unknown	43º25'33" 112º50'49"		702	Irrigation/ Stock	150	424	Est.[1]
Leo Rogers-2	35-2892-A	unknown	unknown		un-known	Irrigation/ Stock	150	424	Est.[2]
Wells located in the vicinity of the Atomic City site									
USGS-001	none	unknown	43º27'00" 112º47'10"		636	GW mon*	[3]	[3]	[4]
USGS-002	none	unknown	43º33'20" 112º43'22"		704	GW mon	[3]	[3]	[4]
USGS-014	none	unknown	43º20'19" 112º56'32"		752	GW mon	[3]	[3]	[4]
USGS-083	none	unknown	43º30'23" 112º56'15"		752	GW mon	6[3]	[3]	[4]
USGS-101	none	unknown	43º32'55" 112º38'18"		856	GW mon	9[3]	[3]	[4]
USGS-103	none	unknown	43º27'14" 112º56'07"		760	GW mon	21[3]	[3]	[4]
USGS-104	none	unknown	43º28'56" 112º56'08"		700	GW mon	16[3]	[3]	[4]
USGS-107	none	unknown	43º29'42" 112º53'28"		690	GW mon	5[3]	[3]	[4]
USGS-110	none	unknown	43º27'17" 112º50'15"		780	GW mon	5[3]	[3]	[4]
Cerro Grande	none	unknown	43º26'18" 112º55'55"		567	Stock	[3]	[3]	[4]
Clement Metz	D0032065	8/2004		01N31E3 sw¼se¼	690	Domestic	unknown	unknown	IDWR
Lark Shrader	unknown	3/1996		01N31E3 sw¼sw¼	685	Domestic	unknown	unknown	IDWR
Atomic City	432638112484101	unknown	43º26'38" 112º48'41"		639	Domestic	unknown	unknown	unknown
Sundown Ranch	D0045602	1/2007		01N30E4 nw¼nw¼	690	Domestic	20+	unknown	IDWR
01N32E34BCB1	unknown	3/1971	43º22'42" 112º41'52"	01N32E34 BCB1	425	Irrigation	unknown	unknown	IDWR
Wheatgrass	431907112560201	10/1974	43º19'07" 112º56'02"		825	Stock	30	unknown	IDWR

[1] Estimated using half of the water right distributed throughout the year.
[2] Estimated using half of the maximum diversion rate of 1.89 cubic feet per second.
[3] USGS monitoring wells equipped with small discharge pumps capable of several gpm.
[4] Source of data – USGS reports.
* Ground-water monitoring
gpm = gallons per minute.

Off-site Wells

The INL encompasses 890 square miles directly north of the Atomic City site (3-036). Hundreds of wells have been drilled on the INL. Most have been drilled for ground water-monitoring purposes, but several production wells have been constructed to supply water for facilities and for special tests. The production wells at EBR-II, 12 miles northeast of the Atomic City site, were test pumped at rates exceeding 1,000 gpm (see Table 3-2). The LSAPT well, 8 miles northwest of the site, was test pumped at 2,800 gpm.

A total of 16 wells are located in the vicinity of the Atomic City site (Figure 3-5). The 16 wells include all wells within the approximately five mile radius around the Atomic City site and selected wells outside that radius to provide a spatially diverse data set for evaluation of the capability of the aquifer to produce water. These wells include USGS monitoring wells, local wells for domestic supply, stock wells, and irrigation wells. Information from these wells is available from the USGS (3-040, 3-033) and from the IDWR online database (3-010).

Nine USGS monitoring wells are located in proximity to the Atomic City site. The closest USGS well is USGS 110, located approximately 2 miles north of the Leo Rogers-1 well. Well USGS-001 is 3.5 miles northeast of the Leo Rogers-1 well. The other wells are from 4 to 11 miles distant. These wells are equipped with dedicated pumps and are used to collect periodic water samples for chemical analyses. Pumping rates generally are about 5 gpm. Well depths range from 567 to 856 feet below land surface.

At least three small-diameter supply wells are located in the vicinity of Atomic City (3-017, 3-018). These wells range in depth from 639 to 690 feet below land surface and likely pump at 20 gpm or less. Two of the wells (Clement Metz, Lark Shrader) are located in Atomic City, approximately 2 miles from the Leo Rogers-1 well. The Metz well provides a source of domestic water supply. The Shrader well is currently unused. The third well is the Atomic City well, providing a source of water to Atomic City. A fourth well was drilled as a domestic supply well (Sundown Ranch), located about 5.6 miles to the west.

The Cerro Grande well (3-040) is used for watering livestock and probably pumps at small rates to supply stock watering tanks. This well is approximately 4 miles west of the Leo Rogers-1 well. The Wheatgrass well, located approximately 8 miles southwest of the Atomic City site, is a BLM stock well. At least one of the USGS monitoring wells also is used to supply stock water to cattle ranchers.

Irrigation well 01N32E-34BCB1 is located approximately 8 miles to the southeast of the Atomic City site (3-017). Total depth of this well is not known. The well likely supplies center-pivot irrigation systems in the area. Pumping rates are not known.

Future Planned Wells

The community of Atomic City has recently received grant money to construct a new supply well and distribution system. Construction of the well and system is scheduled to begin in spring 2007.

A future on-site production well may be required in the event that downhole conditions in the existing irrigation wells (Leo Rogers-1 and Leo Rogers-2) preclude completion as a facility production well.
A future production well at the Atomic City site could take advantage of the full aquifer thickness and likely could produce several thousand gpm, as indicated by other large-volume pumping wells in the area of the site.

3.2.2.2 Existing Aquifer Conditions

A potentiometric-surface map, the representation of the level to which water will rise in a tightly cased well, is a surface contoured using the altitude of measured water levels in wells. A potentiometric-surface map of the Atomic City site provides a method to assess the local rate and direction of ground-water flow and the effect of ground-water withdrawals on water levels in nearby wells.

Extensive water-level datasets for monitoring wells located on the ESRP are maintained by the USGS (3-011) and the IDWR (3-010). These datasets provide water-level information for wells located in the vicinity of the Atomic City site. A comprehensive set of recent water-level measurements, including those from wells near the Atomic City site, was collected by the INL's Waste Area Group (WAG) 10 project team in June 2004 and June 2005 (3-009, 3-008). Water-level data from these selected wells within a radius of 12 miles were used to construct a potentiometric-surface map.

Water-level data measured in 2005 from 11 wells were used for potentiometric-surface map construction. Well locations and water-level data, in feet above sea level, are presented in Table 3-4. Water-level elevations in all wells except well 01N32E-34BCB1 were obtained from the June 2005 INL OU 10-08 dataset (3-008). The water-level elevation in well 01N32E-34BCB1 was measured by IDWR in April 2005 and obtained from the IDWR online ground-water level database (3-010). Because this well (01N32E-34BCB1) provides water-level information southeast of the Atomic City site and the April 2005 data is the nearest measurement relative to time to the June 2005 data collected by the WAG 10 project team, it was used for the potentiometric-surface map construction.

Table 3-4. Wells and water-level data used to create the potentiometric-surface map for the Atomic City area (3-008).

Well Name	Latitude	Longitude	Measurement Date	Elevation of Water Level (feet AMSL)
USGS-110	43º27'17"	112º50'15"	6/13/2005	4428.77
USGS-001	43º27'00"	112º47'10"	6/13/2005	4428.21
CERRO GRANDE	43º26'18"	112º55'55"	6/13/2005	4418.85
USGS-014	43º20'19"	112º56'32"	6/13/2005	4411.78
USGS-103	43º27'14"	112º56'07"	6/13/2005	4419.49
USGS-104	43º28'56"	112º56'08"	6/14/2005	4426.25
USGS-107	43º29'42"	112º53'28"	6/13/2005	4431.21
USGS-101	43º32'55"	112º38'18"	6/14/2005	4471.52
USGS-083	43º30'23"	112º56'15"	6/13/2005	4435.63
01N32E-34BCB1	43º22'42"	112º41'52"	4/6/2005	4422.4
USGS-002	43º33'20"	112º43'22"	6/14/2005	4457.03

AMSL = above mean sea level

Past ground-water withdrawals in the vicinity of the Atomic City site have consisted primarily of pumpage from irrigation wells supplying center pivot and hand line irrigation systems. Minor pumpage has provided a source for domestic supply and livestock watering operations. Irrigation pumpage likely has constituted the major ground-water withdrawal in the area. However, the land within the Atomic City site has not been farmed for several years. Domestic and livestock withdrawals are relatively small and the nearest farmed areas approximately 8 miles away. Based on the limited recent water withdrawals in the area, the 2005 water-level measurements (Table 3-4) are considered to represent conditions approximating a no-pumpage scenario for the Atomic City site. Figure 3-6 presents the no-pumpage potentiometric surface near the Atomic City site produced by contouring the 2005 water-level elevation data presented in Table 3-4. Based on this surface, ground-water flow in the vicinity of the Atomic City site is toward the southwest and the hydraulic gradient is approximately 5.5×10^{-4} (unitless). The hydraulic gradient is the gradient of the potentiometric surface.

3.2.2.3 Estimated Drawdown from Ground- Water Pumpage

Based on the production wells at EBR II and the LSAPT, the Snake River Plain Aquifer at the Atomic City site is capable of producing large quantities of water. The effect of these withdrawals on water levels in the aquifer must be evaluated to enable assessment of the magnitude and significance of potential ground water use conflicts during facility operation. Subsequent sections discuss the impact of average and peak pumpage on water levels in nearby wells and describe the method of drawdown analysis.

Insufficient water-level data are available to construct potentiometric-surface maps for the vicinity of the Atomic City site during periods when irrigated farming was taking place. In order to assess the potential effect of average pumping scenarios on nearby wells, the Thiem equation (3-041) was used to estimate drawdown at different distances from the pumping well. The average pumping scenario was approximated assuming that the annual irrigation water right was averaged over a full year. This scenario assumed pumping from the onsite Leo Rogers-1 well at the rate of 300 gpm.

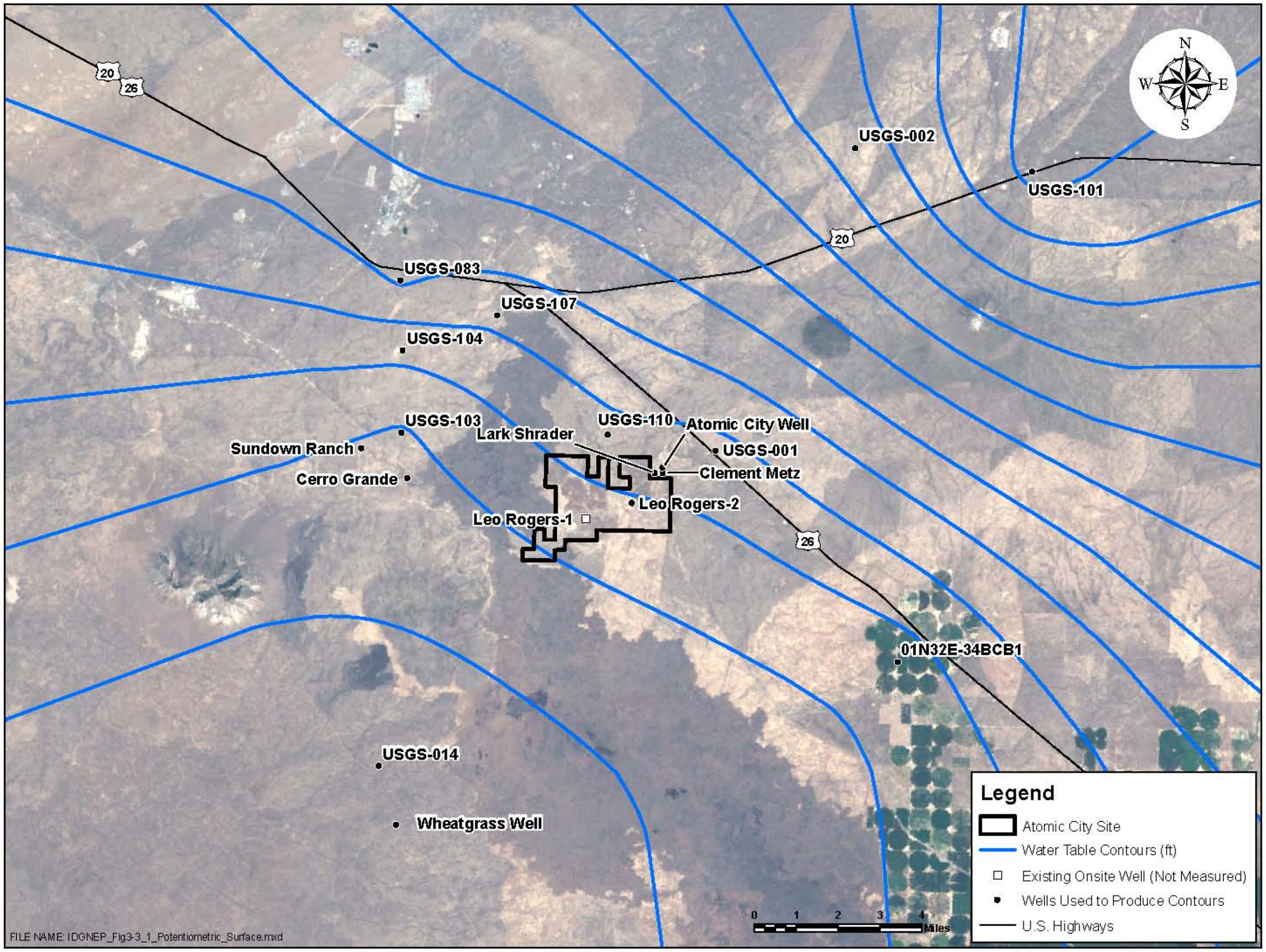

Figure 3-6. 2005 no-pumpage potentiometric surface for the Snake River Plain Aquifer in the vicinity of the Atomic City site (3-008, 3-007).

Average Pumpage

Drawdown was calculated using the Thiem equation, described in a subsequent section. These calculations assumed pumpage from the Leo Rogers-1 well, aquifer hydraulic conductivity of 500 feet per day and aquifer thickness of 650 feet. The hydraulic conductivity estimate is within the range of estimates from large-capacity INL production wells, including EBR II, Auxiliary Reactor Area, and Large Scale Aquifer Pumping Test wells (3-036, 3-045), all drilled through volcanic stratigraphic sequences similar to that occurring within the Atomic City area. The aquifer thickness was based on the minimum thickness estimated by INL scientists in the Atomic City area (3-031, 3-032, 3-034). The estimated hydraulic conductivity of 500 feet per day and thickness of 650 feet assumed in drawdown calculations resulted in a transmissivity estimate of 32,500 feet squared per day. This estimate is approximately 20 percent of the transmissivity estimated by Garabedian in the zone encompassing Atomic City (3-012).

Table 3-5 presents estimated drawdown for different pumping scenarios. According to these drawdown calculations, the only monitoring wells within the radius of 0.01 foot of drawdown for an average pumping rate of 300 gpm are the Leo Rogers-2, Atomic City, Clement Metz, Lark Shrader, and USGS-110 wells. All other area wells are located outside the calculated radius of influence. Figure 3-7 depicts the radial distance of approximately 460 feet from the pumping well within which drawdown exceeding 0.1 foot can be expected as derived from the preceding parameters and assumptions.

Table 3-5. Estimated water-level drawdown in wells in the vicinity of the Atomic City site based on average pumpage (300 gpm), and maximum pumpage (1,000 and 1,500 gpm) from the Leo Rogers-1 well (3-004).

Well Name	Drawdown[1] @ 300 gpm (feet)	Drawdown[1] @ 1,000 gpm (feet)	Drawdown[1] @ 1,500 gpm (feet)
USGS-001	None[2]	0.05	0.1
USGS-002	None[2]	None[2]	None[2]
USGS-014	None[2]	None[2]	None[2]
USGS-083	None[2]	None[2]	None[2]
USGS-101	None[2]	None[2]	None[2]
USGS-103	None[2]	0.01	0.05
USGS-104	None[2]	None[2]	0.02
USGS-107	None[2]	0.007	0.04
USGS-110	0.01	0.1	0.17
01N32E-34BCB1	None[2]	None[2]	None[2]
Atomic City	0.01	0.1	0.17
Cerro Grande	None[2]	0.02	0.06
Clement Metz	0.01	0.09	0.17
Lark Shrader	0.01	0.1	0.18
Leo Rogers-2	0.03	0.15	0.25
Sundown Ranch	None[2]	0.001	0.03
Wheatgrass	None[2]	None[2]	None[2]

[1] Drawdowns estimated using Thiem equation (3-041).
[2] Well is outside the calculated radius of influence of the pumping well.
gpm = gallons per minute.

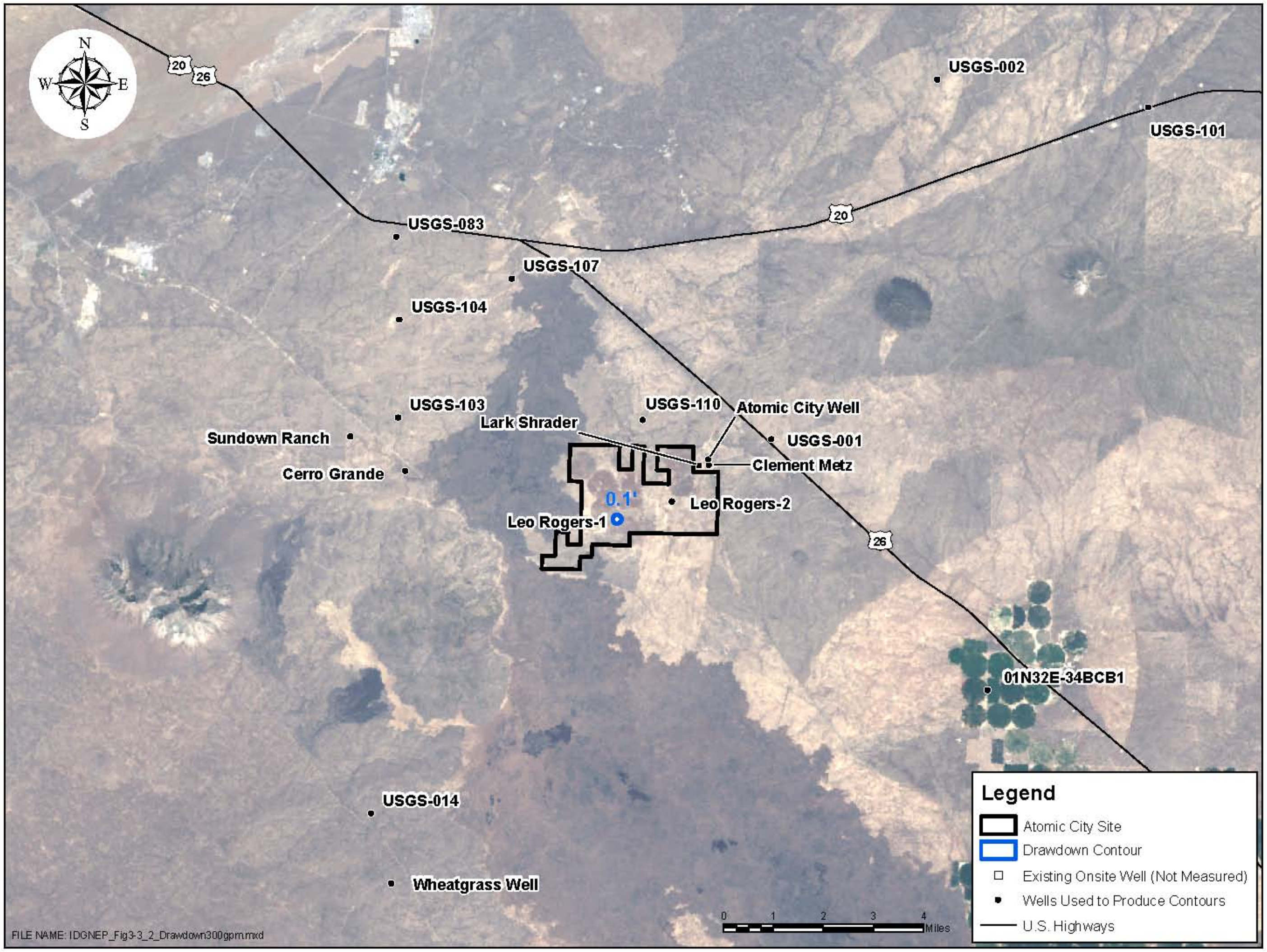

Figure 3-7. Estimated drawdown with respect to adjacent wells at a pumping rate of 300 gpm in the Leo Rogers-1 well, Atomic City site (3-041).

Peak Pumpage

No measured water-level data were available for wells during known peak pumpage periods. In order to approximate drawdown in nearby wells, the Thiem equation (3-041) again was used for peak pumping scenarios. The first scenario assumed a peak pumping rate of 1,000 gpm. A second scenario assumed a peak pumping rate of 1,500 gpm. These two scenarios represent a range of pumpage similar to pumpage rates obtained in INL production wells (3-006, 3-045).

Figure 3-8 and Figure 3-9 depict estimated drawdown for the pumping scenarios of 1,000 gpm and 1,500 gpm respectively. The largest estimated drawdown for both scenarios would be in well Leo Rogers-2. This well, USGS-110, Atomic City, and Lark Shrader wells would be within the 0.1-foot drawdown radius at 1,000 gpm. Drawdown in the Clement Metz, Cerro Grande, USGS-103, and USGS-001 wells would be between within the 0.01 and 0.1 foot (Table 3-5). For the 1,500 gpm scenario, Leo Rogers-2, USGS-110, USGS-001, Clement Metz, Lark Shrader, and the Atomic City wells would be within the 0.1-foot drawdown radius. Drawdown in USGS-103, USGS-104, USGS-107, Cerro Grande, and Sundown Ranch wells would be between 0.01 and 0.1 foot drawdown radius (Table 3-5).

The hydraulic conductivity and thickness assumptions used to calculate drawdown for peak pumpage from the Leo Rogers-1 well are near the lower end of estimated ranges, based on aquifer test and geophysical data. Based on an assessment of nearby large-volume production wells (3-006, 3-045), calculations are conservative and are likely to result in an overestimate of drawdown. These drawdown estimates indicate that the Snake River Plain Aquifer at the Atomic City site should be capable of producing large quantities of water with minimal effect even on the closest wells.

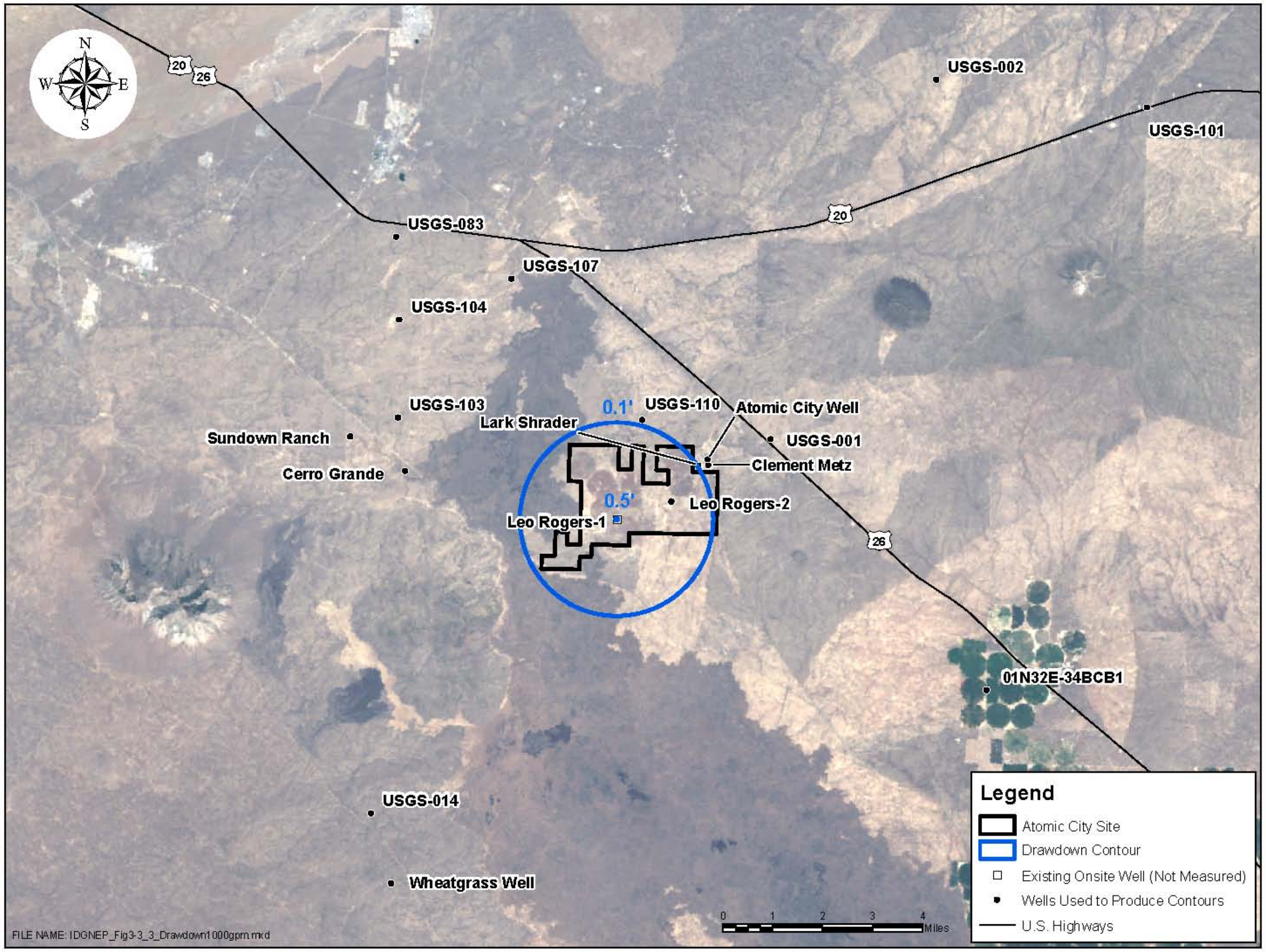

Figure 3-8. Estimated drawdown with respect to adjacent wells at a pumping rate of 1,000 gpm in the Leo Rogers-1 well, Atomic City site (3-041).

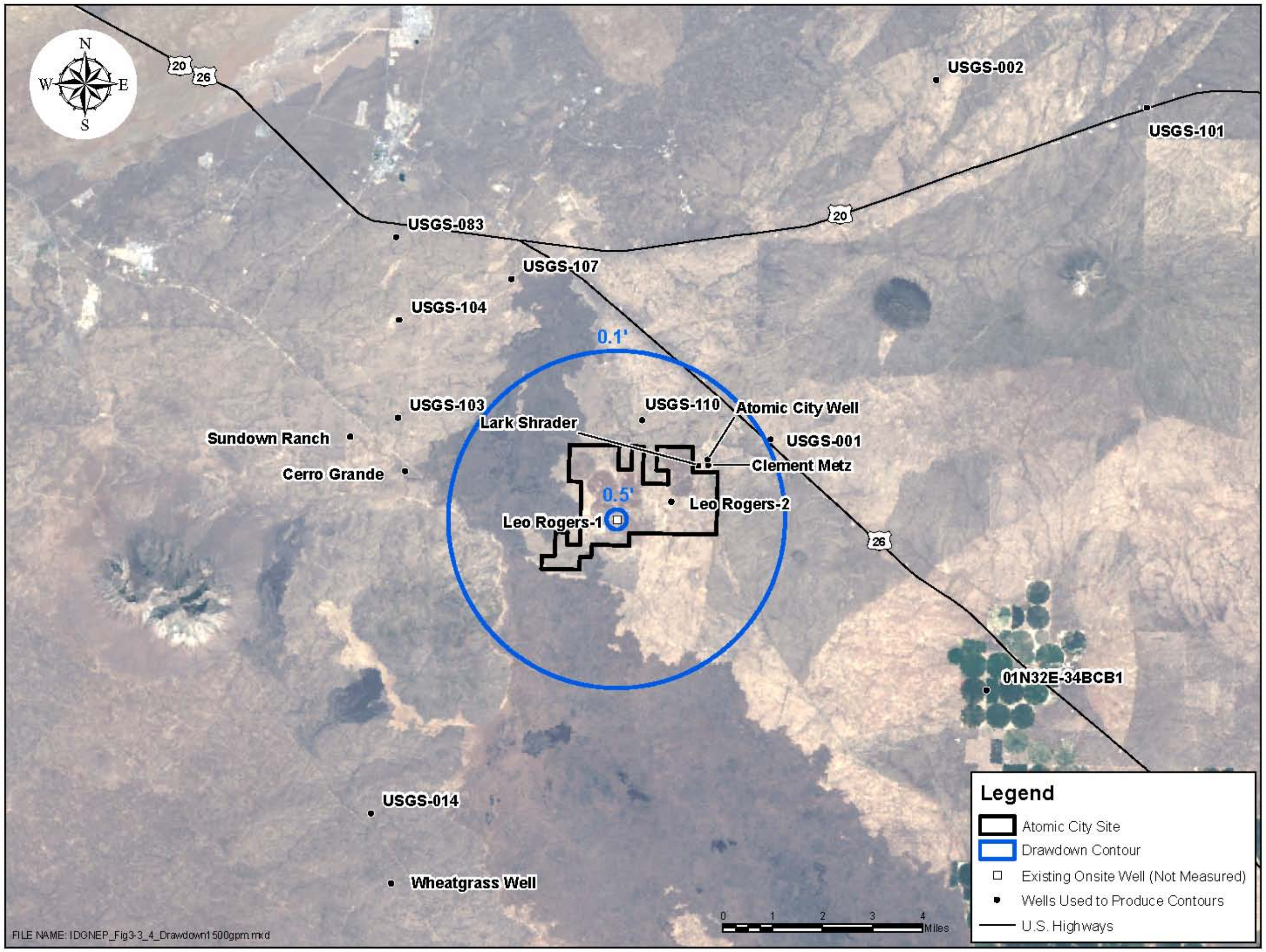

Figure 3-9. Estimated drawdown with respect to adjacent wells at a pumping rate of 1,500 gpm in the Leo Rogers-1 well, Atomic City site (3-041).

3.2.2.4 Description of Methods of Analysis and Assumptions Used to Create the Drawdown Maps

In order to evaluate the effects of pumping on wells on and near the Atomic City site, calculations were performed using the Thiem equation for radial, steady-state flow in an unconfined aquifer (3-041):

$$K = \frac{Q}{\pi(h_2^2 - h_1^2)} \ln\left(\frac{r_2}{r_1}\right) \qquad (1)$$

Where

K is the hydraulic conductivity (Length/Time)

Q is the discharge rate in the pumping well (Length^3/Time)

h_1 is the saturated thickness at distance r_1 from the pumping well (Length)

h_2 is the saturated thickness at distance r_2 from the pumping well (Length)

This equation can be solved for the change in hydraulic head between any two radial distances from the pumping well. If r_2 and h_2 are held constant at the radius of influence of the pumping well while r_1 is varied, h_1 can be calculated at varying distances from the well. Drawdown at each radial distance is calculated as the difference between the saturated thickness of the aquifer (which is equal to h_2 at the radius of influence of the pumping well) and h_1 at each r_1.

The cone of depression resulting from pumpage of any well will continue to grow until either the volume of water pumped from the well is balanced by ground-water recharge inside the cone, or a recharge boundary is reached. In the case of the Atomic City site, recharge from infiltration of precipitation is the only recharge source considered. Infiltration of irrigation water was another source of surface recharge at the Atomic City site in the past; however, it is assumed that any water extracted from an onsite pumping well during operation of a nuclear facility would not be returned to the aquifer via infiltration or injection.

In the case of diffuse spatial recharge via precipitation, the following equation describes the relationship between recharge and radial flow toward a pumping well:

$$Q = \pi r^2 I \qquad (2)$$

Where

Q is the pumping rate from the well (L^3/T)

πr^2 is the surface are of the cone of depression (L^2)

I is the one dimensional recharge rate from precipitation (L/T)

Solving equation (2) for the radius of the cone of depression yields the following:

$$r = \sqrt{\frac{Q}{\pi I}} \qquad (3)$$

The recharge rate from precipitation for the portion of the Snake River Plain containing the Atomic City site has been estimated to be 0.3 inches/year (3-012). This rate is within the range of 2 to 5 percent of local precipitation (see Section 3.2.1.1).

3.2.3 Ground-water Quality

The Snake River Plain Aquifer has been designated a sole-source aquifer under the SDWA (3-013). This aquifer would be the potential receiving ground water source in the vicinity of the Atomic City site. This section will briefly identify and classify this potential receiving ground water source and will discuss the potential impacts to ground-water quality from wastewater disposal.

3.2.3.1 Quality of Potentially Affected Ground Water

The Atomic City site overlies the Snake River Plain Aquifer. Depth to water at the site is almost 600 feet below land surface. Wastewater disposed at the land surface could infiltrate and migrate downward through the thick vadose zone, moving in vertical fractures within the basalt (3-040). Sedimentary interbeds and intervals of massive basalt could result in the development of perched ground-water zones within the vadose zone. INL facilities have disposed of wastewater to unlined infiltration ponds since the early 1950s. These disposals did result in creation of perched ground-water zones. Contaminant migration under these conditions was attenuated through the thick vadose zone.

The Snake River Plain Aquifer is categorized in the Ground-water Quality Rule (3-042) as a General Resource Category aquifer. Within this category, "activities with the potential to degrade General Resource aquifers shall be managed in a manner which maintains or improves existing ground water quality through the use of best management practices and best practical methods to the maximum extent practical." Also, numerical and narrative standards identified in Section 200 of the Ground-water Quality Rule shall apply to water of the Snake River Plain Aquifer.

Dissolved constituent concentrations in water from the Snake River Plain Aquifer are relatively uniform throughout the aquifer. Olmstead (3-043) observed that dissolved solids concentrations averaged slightly more than 200 milligrams per liter. More recent evaluations of concentration data (3-016, 3-044) have shown that dissolved radionuclide, inorganic, trace element, and organic compound concentrations in the vicinity of the Atomic City site are typically less than the water quality standards for primary and secondary constituents specified in the Ground-water Quality Rule.

Contaminants that may be contained in water disposed either through injection wells or to unlined infiltration ponds can be expected to increase dissolved concentrations and to decrease the quality of water contained in the Snake River Plain Aquifer. Any facilities requiring wastewater disposal to the subsurface in the Atomic City area would need to comply with the requirements specified in the Ground-water Quality Rule through the use of best management practices and best available methods. Idaho Department of Environmental Quality (IDEQ) requirements for disposal of wastewater through land application are discussed in Section 12.4.3.1, and requirements for disposal of wastewater by means of underground injection are discussed in Section 12.4.4.3 of this report.

3.2.3.2 Existing Contamination with Actual or Potential Affect on Ground-Water Quality

The two most likely sources of potential ground-water contamination at the Atomic City site are agricultural contamination and ground-water contamination associated with facilities at the INL. No industrial facilities, fuel filling stations, or other commercial enterprises that are common sources of ground-water contamination exist within 5 miles upgradient of the Atomic City site.

Potential Agricultural Contamination

Agricultural contaminants may migrate to ground water in any location where excess precipitation or irrigation water produces ground-water recharge from a land surface where pesticides or fertilizers have been applied. Very little irrigated agricultural land exists within 20 miles of the site in the upgradient direction because the Atomic City site lies just south of the INL. Crops were formerly produced on the Atomic City site; however, the nearest current irrigated agriculture is located approximately 5 miles to the southeast of the site in the cross-gradient direction.

The IDWR samples many wells to determine the quality of ground water in the aquifers of the State of Idaho. The Atomic City well and the Wheatgrass well (IDWR 432638112484101 and 431907112560201) are included in IDWR's monitoring network near the Atomic City site (Figure 3-5). The Atomic City well is completed to a depth of 639 feet below ground surface. The Wheatgrass well is a livestock water-supply well downgradient of the Atomic City site. It is completed to a depth of 825 feet below ground surface.

The most common ground water contaminants resulting from agricultural land uses are nutrients (in particular nitrates) and pesticides. Nitrate is a common constituent of fertilizers. Pesticides are often applied to fields to kill insects and other pests that are detrimental to crops.

Agricultural contamination is a nonpoint source pollution problem. Nonpoint source pollution results when potential contaminants are spread out over a large area (as in the case of fertilized fields where crops are grown) rather than discharge from a source such as a leaky pipe or other discharge point.

The Atomic City well was sampled for compounds including nitrate and pesticides in August 1992 (3-019). No pesticides were detected at laboratory reporting limits during that sampling event, and the concentration of nitrate was 1.1 milligrams per liter, well below the federal maximum contaminant level (MCL) of 10 milligrams per liter. MCLs are enforceable maximum drinking water concentrations for public water supplies.

The Wheatgrass well was most recently sampled for inorganic constituents in June 2004. The nitrate concentration was 1.17 milligrams per liter during that sampling event. In June 2000, a more complete set of constituents was analyzed. At that time, the nitrate concentration was 1.16 milligrams per liter and no pesticide compounds were detected. The concentrations of total phosphorus, another nutrient and a constituent of fertilizers, were below laboratory reporting and drinking water action limits (3-019).

In the case of irrigated agriculture, the volume of contaminated water that can reach the aquifer is limited by the volume of ground-water recharge, the uptake of the contaminants by plants, and reduction of contaminant concentrations in the vadose zone and in the aquifer between the source and the Atomic City site. Ground-water recharge from infiltrating precipitation is very small in the central portion of the Snake River Plain (3-012). The vadose zone is approximately 600 feet thick, and no evidence exists of significant agricultural contamination near the Atomic City site; therefore, the potential for detectable concentrations of agricultural contaminants to reach the aquifer is small.

Agricultural contamination via nutrients can be expected only where fertilizers are applied at rates exceeding their uptake rate by plants and where infiltration of precipitation and irrigation result in ground-water recharge through deep soil water percolation. The area over which fertilizers are applied would also be expected to affect the concentration of nutrients in ground water. Because very little irrigated agriculture exists within the 20 miles immediately upgradient of the Atomic City site, the setting of the Atomic City site is not conducive to ground-water contamination by agricultural contaminants.

No evidence exists that irrigated agriculture has had a significant impact on ground-water quality at the Atomic City site. Because the INL lies upgradient of the Atomic City site and an industrial use is planned for the subject property, no future impacts on ground-water quality from irrigated agriculture are expected.

Potential Contamination from INL Facilities

Ground-water contamination resulting from INL operations has been heavily investigated. Ground-water contamination plumes exist at and near the Central Facilities Area (CFA), the Idaho Nuclear Technology and Engineering Center (INTEC), the Test Reactor Area (TRA), Test Area North (TAN), and the Radioactive Waste Management Complex (RWMC) (3-031). None of these plumes lies within 5 miles of the Atomic City site. Figure 3-10 shows the locations of ground-water plumes at the INL where contaminant concentrations exceeded federal MCLs for one or more compounds in 2003.

Ground-water plumes at the INL are presented in Figure 3-10. Given that ground-water flow is generally to the southwest, these contaminant plumes are considered to be cross gradient to the Atomic City site and are not expected to impact ground-water quality at the site.

The contaminants of concern in INL ground-water plumes include metals and radioactive and volatile organic compounds. None of those contaminants impacts ground water beneath the Atomic City site due to the large distance (greater than 5 miles) between the Atomic City site and the known INL ground-water plumes and to the southwest direction of ground-water flow.

No contaminated ground water from known INL ground-water plumes impacts ground water beneath the Atomic City site. Ground-water contamination at the INL results from industrial operations and waste disposal practices; however, none of the contaminated ground water at the INL impacts ground water beneath the Atomic City site because contaminant source areas are not upgradient from the site. The nearest existing ground-water plumes at the INL lie cross-gradient from the Atomic City site based on the generally observed northeast to southwest flow direction in the Snake River Plain Aquifer. The nearest upgradient INL facility is the Materials and Fuels Complex (formerly called Argonne National Laboratory-West [ANL-W]). No ground-water contamination is known to be migrating offsite from the Materials and Fuels Complex toward the Atomic City site (Figure 3-10).

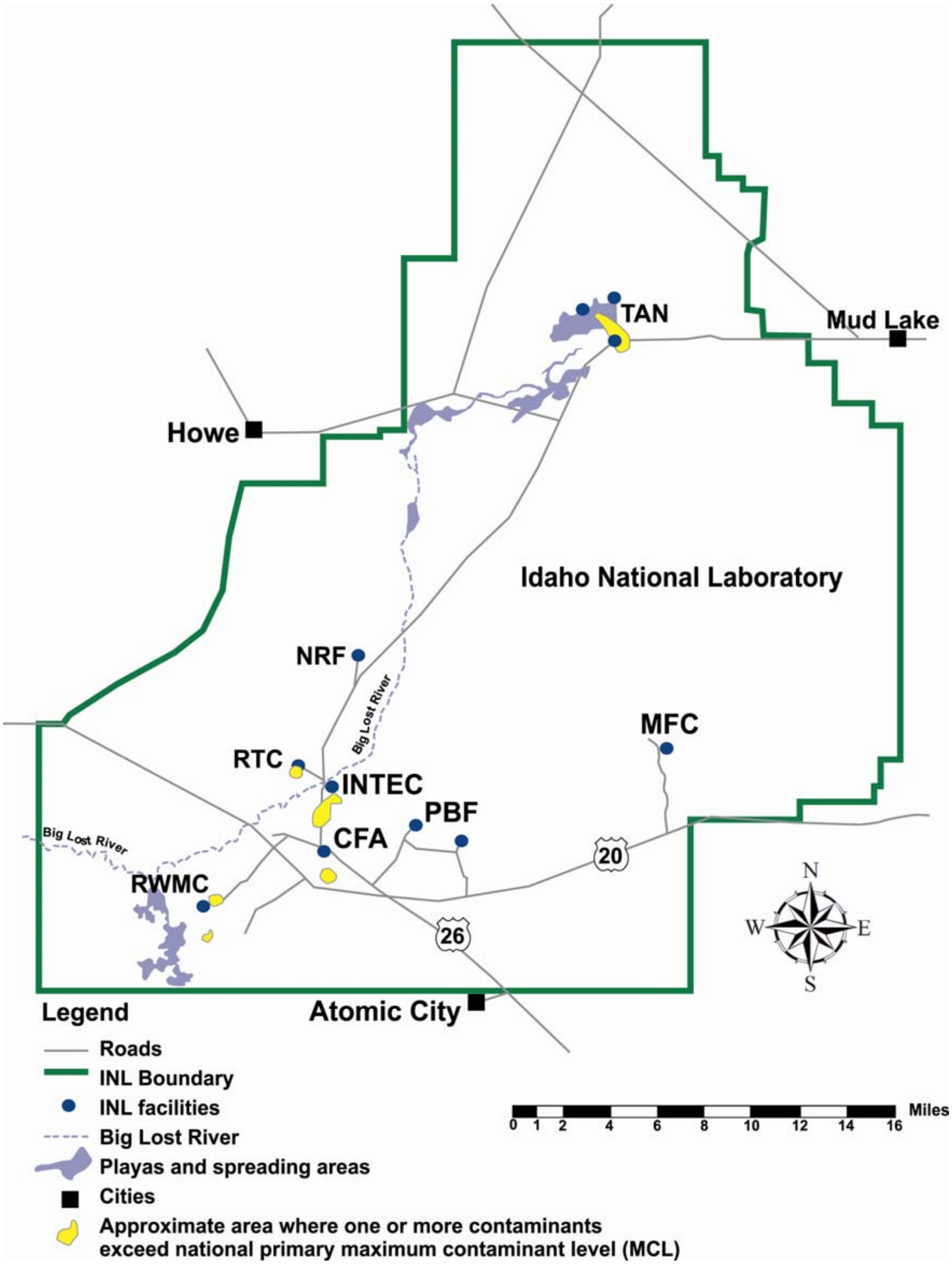

Figure 3-10. INL ground-water plumes where one or more contaminants exceeded MCLs in 2003 (3-031).

3.3 Surface-Water Resources

It is not anticipated that surface water would be used at the Atomic City site because an adequate supply of ground water is available. This section will briefly identify and classify potential receiving surface-water sources located in proximity to the Atomic City site and discuss the potential impacts to surface-water quality from wastewater disposal.

3.3.1 Surface-water Systems

The ESRP is drained by the Snake River and its tributaries (3-012). This river is a major surface-water body that runs from Wyoming into southeastern Idaho, then across Idaho to the west and turning north to form the border between Idaho, Washington, and Oregon. The Snake River flows onto the ESRP from its headwaters on the highlands of the Yellowstone Plateau and continues across the southeastern extent of the plain, coming within 25 miles of the Atomic City site. The Snake River flows into American Falls Reservoir, approximately 25 miles south of the site and continues westward, exiting the plain near King Hill. Major springs along the lower reaches of the Snake River discharge most ground-water flow from the Snake River Plain Aquifer, contributing substantial flows to the river.

Several of the tributary basins along the northwestern side of the ESRP drain into a topographically depressed area isolated from the Snake River Plain by the highlands of the Axial Volcanic Zone (3-031). These streams, consisting of the Big Lost River, Little Lost River, and Birch Creek, drain internally, terminating in playas in the vicinity of Howe and Mud Lake. The Big Lost River is the closest stream to the Atomic City site.

The Big Lost River, located on the northwest side of the ESRP, derives its name from the fact that most streamflows rapidly infiltrate along its channel. The Big Lost River drains into a closed basin and is not tributary to any other river. The upper part of the Big Lost River Basin trends to the southeast and is bounded by the Lost River Range and Pioneer Mountains along its northern, western, and southern boundaries (3-027). During average hydrologic years, flows on the river completely infiltrate north of Arco, Idaho. In high precipitation years, streamflows continue downstream southeast of Arco onto the ESRP. The stream channel in this area trends east and crosses the western boundary of the INL approximately 7 miles downstream from the USGS Arco stream-gaging station. The INL constructed a diversion dam and channel during the 1950s another 6 miles downstream to divert floodwaters into spreading areas and to protect INL facilities. The river channel continues north of INL facilities into an area known as the Big Lost River Sinks, characterized by large infiltration rates. Within the sinks, higher streamflows rapidly infiltrate and recharge the aquifer. North of the Big Lost River Sinks, the Big Lost River drains into the terminal playas near Howe and Mud Lake.

3.3.2 Surface-water Quantity

According to Garabedian, 72 percent of the total tributary drainage-basin yields are derived from the Snake River and Henrys Fork, both originating on the Yellowstone Plateau (3-012). Streamflow data are available for the Snake River near Heise from 1911 to the present and for Henrys Fork from 1927 to the present (3-011). Combined average flows onto the plain from these two drainages total approximately 8,500 cubic feet per second. A source of water supply for the Atomic City site from the Snake River would require construction of a pipeline at least 25 miles in length.

The Atomic City site is located 9.5 miles from the Big Lost River as it flows east of Arco and onto the INL. The USGS gaging station located near Arco has registered no flow in 12 of the past 22 years. Based on this information, the Big Lost River would not be a reliable source of water for the Atomic City site.

3.3.3 Quality of Potentially Affected Surface Water

The nearest water course to the Atomic City site is the Big Lost River. The Atomic City site is not connected to the Big Lost River by any developed drainage system. The topography and the poorly drained character of the ESRP in this area preclude the Big Lost River as a potential receiving surface-water feature.

No developed drainage system occurs between the Atomic City site and the Snake River. Similar to the Big Lost River, the topography and poorly drained character of the ESRP in this area preclude the Snake River as a potential receiving surface-water feature.

3.3.4 Existing Contamination with Actual or Potential Effect on Surface-Water Quality

The only potential for existing contamination at the Atomic City site would be from previous application of agricultural chemicals as fertilizers and pesticides. No drainage system connects the site to the Big Lost River, located 9.5 miles to the northwest, or to the Snake River, located 25 miles to the southeast. Existing contamination at the Atomic City site, if present, would have no potential to impact the quality of surface water in the area.

3.3.5 Potentially Affected Wetlands

As defined in the USACE Wetlands Delineation Manual, wetlands are characterized as areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions (3-002).

As previously described in Section 2, *Aquatic and Riparian Ecological Communities*, no perennial aquatic habitat and aquatic species occur within the Atomic City site. Several small, ephemeral streams are identified from USGS 7.5 minute topographic maps near the Atomic City site, but these are anticipated to contain water only after storm events or during snowmelt. In addition, a riparian ecological community likely does not exist in or near the site because of the dry climate and lack of perennial surface water, and any riparian vegetation that may be present will likely be restricted in extent. Baseline ecological surveys (including photographic documentation) of the Atomic City site confirm this conclusion. These data and field observations support the conclusion that no wetlands exist within the Atomic City site.

In addition, the depth to ground water is almost 600 feet below land surface. Based on the observation that wetlands are not present and on the occurrence of a thick, intervening vadose zone between the land surface and the water table, changes in ground-water levels would have no effect on wetlands or any surface-water feature at the Atomic City site.

3.4 Water Availability

Due to the distance of suitable surface water from the Atomic City site, appropriation of surface water for the site's water supply would not be likely. Based on the current understanding of the Snake River Plain Aquifer, this source of second water supply would be capable of providing significant quantity of water to wells at the Atomic City site. Subsequent sections describe the availability of water and water rights.

3.4.1 Ground Water

The Atomic City site overlies the Snake River Plain Aquifer, which is capable of providing a substantial supply of ground water. A complete description of the aquifer is provided in Section 3.1. The Snake River Plain Aquifer is thought to contain as much as a billion acre-feet of water. Eighty to 120 million acre-feet is stored in the top 200 feet of the aquifer and can be readily pumped and used (3-005). Ground-water levels in the aquifer are influenced by the amount of water that recharges the aquifer and by the amount of water that is withdrawn for agricultural irrigation and other purposes (3-030).

The Atomic City site currently has two large-diameter wells located on the site with a water right to pump ground water from the aquifer. This source of ground water could be delivered to the Atomic City site by pumpage from these or additional on-site wells.

3.4.2 Water Rights

This section describes existing and known future ground-water rights for the Atomic City site. Under Idaho's statutes and constitution, a water right is a real property right much like property rights in the land. Water rights are established by appropriation of water to a beneficial use. Idaho does not recognize the riparian water rights doctrine (3-024, 3-023).

As part of a 1984 settlement of a dispute between Idaho Power Company and the State of Idaho over Idaho Power Company's water rights for hydroelectric power, the entire Snake River Basin, which includes the Snake River and its tributaries, is undergoing a water rights adjudication for both ground and surface water (3-026, 3-025).The adjudication commenced in 1987 and is ongoing. As water rights are confirmed through the adjudication process, partial decrees are issued subject to a final decree for the entire Snake River Basin.

3.4.2.1 Existing Rights

The existing ground-water right for the Atomic City site is the subject of a partial decree entered in the Snake River Basin Adjudication on January 31, 2002 (3-020). The water right allows a diversion rate of 1.89 cubic feet per second or volume of 483 acre-feet per year. The water right is currently for irrigation use from April 15 to October 15 each year. On an annual basis, the volume of 483 acre-feet would supply approximately 300 gpm. To utilize this water right for GNEP, the process for transferring the water right under Idaho law would be followed to transfer the type of use from agricultural to industrial use and to transfer the period of use from seasonal to year-round (3-021). If additional ground-water supplies were needed, water could be obtained through transfers of existing water rights from other locations to the site, or by obtaining a permit to appropriate additional ground water from the Snake River Plain Aquifer. There are no Native American tribal water rights related to the Atomic City site.

3.4.2.2 Known Future Rights

The water right described above is the only water right that has been identified for the Atomic City site. There are no known future rights, including Native American tribal rights, that would be claimed or would impact the existing water right for the property.

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* Indicates those sources considered but not cited.

CONTENTS

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4. CRITICAL AND IMPORTANT TERRESTRIAL HABITATS

This section describes critical and important terrestrial habitats that occur within the proposed Atomic City site that have the potential to be disturbed by construction and operation of the GNEP facilities. Because the distribution of vegetation communities, and hence animal communities, is partly determined by climate and underlying soil properties, these resources are also briefly described for the site. More detailed climatology data are presented in Section 10, *Weather/Climatology*, and geological characteristics of the site are discussed in Section 9, *Geology/Seismology*. The dominant plant communities present at the site and the animals that are likely to use those communities are described in this section. Special status species (i.e., species covered under the ESA or species of special concern to other federal, state, or local agencies) are discussed in Section 5, *Threatened or Endangered and Special Concern Species*. Section 1, *Maps*, provides the location and a description of the proposed project. The base information for maps presented in this section originates from the Section 1 maps. Overlay map data associated with the specifics of this section will be referenced as appropriate.

4.1 Overview and Summary

The Atomic City site proposed for construction of the GNEP Consolidated Fuel Treatment Center demonstration facility and/or the Advanced Burner Reactor is at a remote location that has the potential to disturb plant or wildlife habitat. Important habitat areas surrounding this site have been addressed in sufficient detail to allow for the proposed environmental reviews. This information represents the best available data to support analysis of the potential environmental impact of constructing and operating the GNEP facilities.

Review of the critical and important terrestrial habitat surrounding the Atomic City site led to the conclusions that:

- There is no designated critical habitat at the Atomic City site.
- The important terrestrial habitat at the Atomic City site is comprised of sagebrush steppe, which is an important habitat for sagebrush-obligate species such as sage grouse and pygmy rabbit that are species of concern. Within the boundaries of the Atomic City site, the majority of this habitat has been converted to a crested wheatgrass/cheatgrass community that has been used for domestic livestock grazing and agricultural purposes.
- The ecological sites in the general area provide habitat that support a resident animal community that includes pronghorn antelope, sage grouse, coyotes, and black-tailed jackrabbits.

4.2 Background

This section briefly describes regulatory requirements for critical habitat, provides a large-scale ecological description of the Atomic City site, summarizes regional climatology, describes site specific soils and primary ecological sites present at the Atomic City site, and identifies the field methodology used to identify critical and important habitat at the Atomic City site.

4.2.1 Regulatory Requirements

The ESA (4-039) requires the federal government to designate “critical habitat” for any species it lists under the ESA. “Critical habitat” is defined as 1) specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to conservation, and those features may require special management considerations or protection, and 2) specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation (4-039).

Under Section 7 of the ESA, all federal agencies must ensure that any actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of a listed species, or destroy or adversely modify its designated critical habitat. These complementary requirements apply only to federal agency actions, and the latter only to habitat that has been designated as critical. A critical habitat designation does not set up a preserve or refuge, and applies only when federal funding, permits, or projects are involved. Critical habitat requirements do not apply to citizens engaged in activities on private land that do not involve a federal agency.

Section 5, *Threatened or Endangered and Special Concern Species*, discusses ESA-listed species in detail. As detailed in that section, two endangered species (gray wolf - Experimental Nonessential population, and Utah valvata snail), four threatened species (bald eagle, Ute ladies’-tresses, Canada lynx, and bull trout), and one candidate species (yellow-billed cuckoo) have been identified by the USFWS with the potential to occur within Bingham and Butte Counties adjacent to the Atomic City site (4-038). Critical habitat for bull trout also has been proposed in Butte County—but no formally designated critical habitat for this species, or any other species, has been identified within or near the Atomic City site; thus, critical habitat is not an issue for this site.

Important terrestrial habitats can be defined in a number of different ways. For the purposes of this report, a broad definition of important terrestrial habitat has been adopted and is described as that which 1) is present within the Atomic City site and 2) provides significant habitat to plant and/or animal species that might not be abundant elsewhere in the vicinity of the project. Important species are described as those that 1) have high public interest, economic value, or both or 2) may be critical to the structure and function of the ecosystem or provide a broader ecological perspective of the area.

The area surrounding the Atomic City site is comprised of sagebrush steppe, which is an important habitat for sagebrush-obligate species, such as sage grouse and pygmy rabbit. Within the boundaries of the Atomic City site, this habitat has been converted to a crested wheatgrass/cheatgrass vegetative community. The largest remaining area of native sagebrush habitat that exists within the Atomic City site is found in the southwest corner. This tract of native sagebrush habitat is bounded by the railroad on the west and south, the main gravel road on the north, and a lava flow on the east. Small remnants of the sagebrush habitat are scattered throughout the remainder of the Atomic City site and are primarily associated with rocky outcrops and undeveloped corners of the agricultural irrigation pivots (4-020).

4.2.2 Major Land Resource Areas

Beginning in 1965, soil scientists subdivided the U.S. into a number of land resource regions that were made up of many Major Land Resource Areas (MLRAs) with similar soils, climate, and vegetation or crop types. Land resource regions provide a large-scale description of the resource conditions present within a region. The Atomic City site is located in the Northwestern Wheat and Range Land Resource Region (4-036). This region is an area of smooth to deeply dissected plains and plateaus with a few isolated mountain ranges. Well developed terraces are present along the Snake River. This region is primarily a mixture of grazing and agricultural land, with grazing being the major land use in the drier parts of the region. Overgrazing and invasion of undesirable plant species are resource management concerns on the lands that are used for grazing (4-036).

Land resource regions are then divided into MLRAs. The Atomic City site is located in the Snake River Plains MLRA (#11) (4-036). This MLRA is geologically young, with nearly level to gently sloping lava plateaus, and largely consists of basaltic plains. See Section 9, *Geology/Seismology*, for a detailed discussion of the geology of the Snake River Plain. The present-day Snake River cuts through the glacial outwash, lacustrine deposit, and river alluvium and into the lava plain on the valley floor, leaving the broad terraces that exist along the river today (4-036). The area supports an overstory of sagebrush and an understory of grasses.

4.2.3 Climate

Climatology of the area is discussed in greater detail in Section 10, *Weather/Climatology*. Climate information is presented here to address climate influences on the habitat. Native vegetation in the general geographic area is typical of the cold desert regions of the Great Basin and is restricted to an overstory of sagebrush and an understory of bunchgrasses due to the climate and poorly developed soils (Figure 4-1). The Figure 4-1 map was created using the base data from Section 1, *Maps*, and it is overlaid with vegetation data from the Idaho Gap Analysis Project (4-046) using the parameters established by the USGS (4-040). The average annual precipitation is approximately 9 inches. The annual average temperature ranges from 26.8 to 57.1°F (4-035). Strong winds are common and contribute to rapid evaporation of moisture. No surface water is present in the Atomic City site.

4.2.4 Soils

Within a particular area, differences in the type and amount of rangeland vegetation are closely related to the kind of soil present; therefore, soil-type information is important because it affects the vegetation present and habitat suitability for wildlife species. There are six main map units within the Atomic City site. A map unit delineation on a soil map is not an exact line of soil change and represents an area dominated by one or more major kinds of soil, which are then described as soil complexes. The objective of the mapping is to separate the landscape into landforms or landform segments that have similar use and management requirements. The soils database (4-014, 4-015) indicates that the primary soil map units in the Atomic City site are:

- Atom silt loam, 1 to 3 percent slopes,
- Coffee silt loam, 1 to 4 percent slopes,
- Coffee-Nargon-Atom complex, 2 to 12 percent slopes,
- Lava Flows-Pingree complex, 0 to 8 percent slopes,
- Nargon-Deuce-Lava flows complex, 0 to 20 percent slopes, and
- Pancheri-Polatis, 2 to 12 percent slopes.

Figure 4-2 shows the soil map units for the Atomic City site. This map uses the base map as described in Section 1, *Maps*, and is overlaid with a soils data layer from the NRCS (4-043).

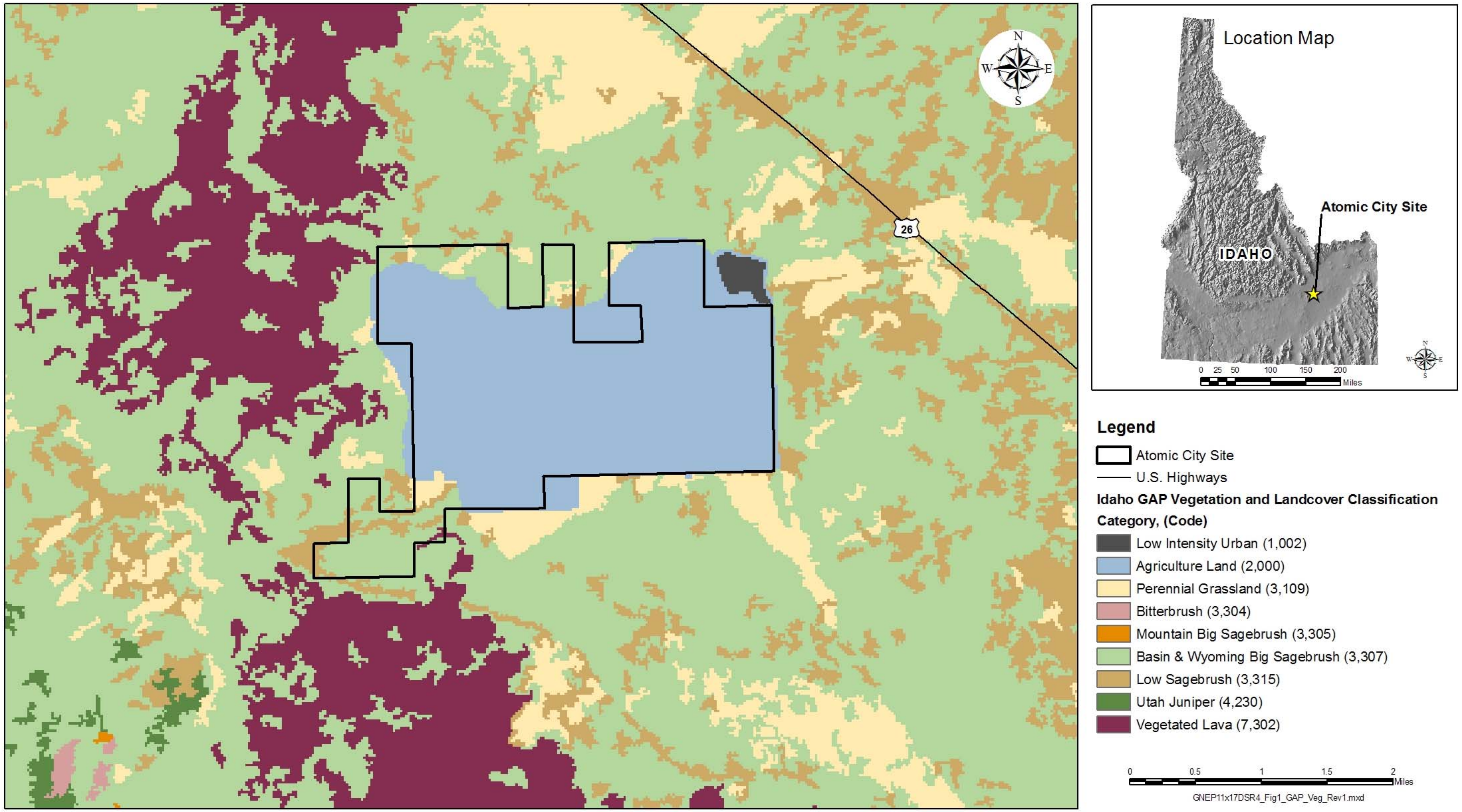

Figure 4-1. Vegetation cover in the Atomic City site from Idaho GAP (4-046).

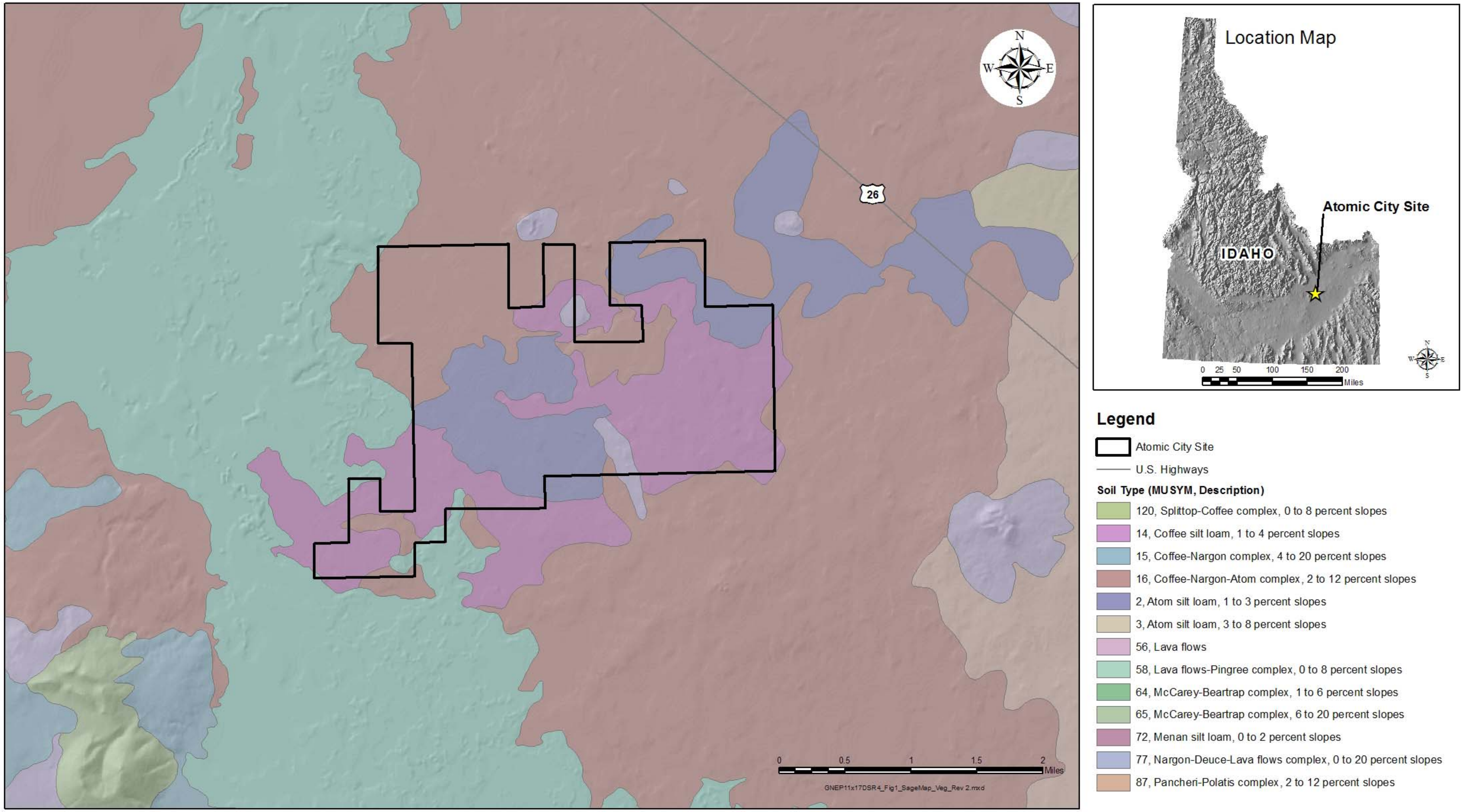

Figure 4-2. Soil map units on the Atomic City site (4-014, 4-015).

The percentages of these six soils within the Atomic City site are listed in Table 4-1 and brief descriptions are provided below. An important component of the soil description is the ecological site description with which it is associated. The ecological site description is provided below. These soils are moderately extensive in southeast Idaho and primarily support range and wildlife habitat (Figure 4-2). Topsoil usually remains frozen from mid to late November through February or early March (4-018). The soils are poorly developed due to this frozen condition and the low precipitation levels in the Atomic City site area. Forage production on all soils is limited by low precipitation. Seeding is also limited by low precipitation as well as by the moderate hazard of water and wind erosion. Brief descriptions of these soil types are provided below.

Table 4-1. Map units present in the Atomic City site (4-026).

Map Unit Symbol	Map Unit Name	Acres in Atomic City Site	Percent of Atomic City Site
2	Atom silt loam	879.4	27
14	Coffee silt loam	1379.4	41
16	Coffee-Nargon-Atom	917.6	28
58	Lava Flows-Pingree	78.6	2
77	Nargon-Deuce-Lava Flows	54.2	2
87	Pancheri-Polatis	0.8	0

Atom Silt Loam

The Atom silt loam series consists of very deep, well-drained soils that formed in mixed alluvium overlying basalt. Atom soils typically occur on lava plains, but are also found on terraces and alluvial fans that join lava plains. They make up 27 percent of the area. These soils have slow to rapid runoff characteristics and moderately slow permeability (4-015).

Coffee Silt Loam

The Coffee silt loam series consists of deep, well-drained soils that formed in alluvium from loess underlain by basalt. Coffee soils occur on basalt plains. These soils have slow to moderate runoff characteristics and moderate permeability. They make up 41 percent of the area. The Coffee and Atom soils have moderate salinity (4-015).

Coffee-Nargon-Atom

The Coffee-Nargon-Atom complex makes up 28 percent of the Atomic City site. The Nargon series consists of moderately deep, well-drained soils that formed in alluvium from loess and basalt on lava plains. Nargon soils occur on lava plains. These soils have slow to rapid runoff characteristics and moderately slow permeability (4-015).

Lava Flows-Pingree

Pingree soils are shallow, well-drained soils formed from loess derived from basalt. Bedrock is between 5 and 10 inches below soil surface and occurs on 2 percent of the Atomic City site. Generally, these soils are found on rims and on lava plains. They have slow to rapid runoff characteristics and moderately slow permeability (4-014).

Nargon-Deuce Lava Flows

Deuce soils are associated with lava flows and make up 2 percent of the Atomic City site. The Deuce series consists of shallow, well-drained soils that formed in mixed alluvium and/or loess over bedrock. The depth to bedrock is 10-20 inches and the vegetation is generally sagebrush with bluebunch wheatgrass in the 8-12 inch precipitation zone. Generally these soils are found on rims and on lava plains. They have slow to rapid runoff characteristics and moderately slow permeability (4-014).

Pancheri-Polatis

The Pancheri-Polatis complex represents a very small portion of the Atomic City site (0.8 acres). The Pancheri series consists of well-drained, nearly level to moderately sloping soils. These soils formed under big sagebrush and bunchgrass in loess. They are present on rolling upland plains. Pancheri soils are associated with soils of the Polatis, Tenno, and Kimama series. These soils have slow to rapid runoff characteristics and moderately slow permeability (4-014).

The Polatis series consists of well-drained, nearly level to moderately sloping soils that are 20 to 40 inches deep to bedrock. These soils formed under big sagebrush and bunchgrass in limy loess. They are located on undulating uplands. Polatis soils are associated with Pancheri, Tenno, and Kimama soils. These soils have slow to rapid runoff characteristics and moderately slow permeability (4-014).

4.2.5 Ecological Site Description

An ecological site is the product of all the environmental factors responsible for its development. It has characteristic soils that have developed over time and a characteristic plant community (type and amount of vegetation). The hydrology of the site is influenced by development of the plant and soil community. The vegetation, soils, and hydrology are all interrelated. The plant community on an ecological site is typified by an association of species that differs from that of other ecological sites in the type and/or proportion of species. In the Atomic City site, there is only one plant community Wyoming big sagebrush/bluebunch wheatgrass (NRCS designation: ARTRW8/PSSP6). The same plant community extends to all of the soil types within the area.

The shrub steppe habitat, which surrounds Atomic City, covers approximately 173,746 square miles of the northern Intermountain West Region. Though the habitat is vast, shrub steppe degradation, fragmentation, and loss have occurred through agriculture, development, grazing, wildland fire, and other means. Historically, vegetation in the Atomic City site was dominated by basin and Wyoming big sagebrush associated with several species of bunchgrasses.

Vegetation types present on the ecological site found within the Atomic City site are predominantly bluebunch wheatgrass and Wyoming big sagebrush. As this site degrades, bluebunch wheatgrass, Thurber's needlegrass, and desirable forbs decrease and Wyoming big sagebrush, cheatgrass, and undesirable weedy forbs increase (4-014).

The ecological site in the project area occurs on nearly level flats or benchlands to rolling or broken foothills between outcrops of lava or as lava flows that are highly fractured and have vegetation growing where soil material has accumulated. Small lava outcrops may be scattered throughout the area and range from nearly level to about 30 percent slopes.

This ecological site provides habitat that supports a resident animal community characterized by pronghorn antelope (*Antilocapra americana*), sage grouse (*Centrocercus urophasianus*), coyote (*Canis latrens*), black-tailed jackrabbit (*Lepus californicus*), ferruginous hawk (*Buteo regalis*), prairie falcon (*Falco mexicanus*), western rattlesnake (*Crotalus viridis*), horned lark (*Eremophila alpestris*), black-billed magpie (*Pica pica*), and short-eared owl (*Asio flammeous*). This site may also be used in the winter by elk (*Cervus elaphus*) and mule deer (*Odocoileus hemionus*), among others.

4.2.6 Characteristic Vegetation

Natural vegetation is a result of the combination of geography, soils, and climate of an area. Table 4-2 contains information about the characteristic vegetation associated with the soil types and ecological site described above (4-015). Characteristic vegetation lists the grasses, forbs, and shrubs that make up most of the potential natural plant community for a site.

Table 4-2. Soil types, ecological sites, and characteristic vegetation (4-026).

Soil Name	Ecological Site[1]	Characteristic Vegetation	Rangeland Composition[2]
Nargon	ARTRW8/PSSP6	Bluebunch wheatgrass	30
		Wyoming big sagebrush	25
		Sandberg bluegrass	10
		Thurber needlegrass	10
		Indian ricegrass	5
		Longleaf hawksbeard	5
		Nevada bluegrass	5
		Threetip sagebrush	5
		Needle and thread	3

Table 4-2. (continued).

Soil Name	Ecological Site[1]	Characteristic Vegetation	Rangeland Composition[2]
Coffee	ARTRW8/PSSP6	Bluebunch wheatgrass	30
		Wyoming big sagebrush	25
		Sandberg bluegrass	10
		Thurber needlegrass	10
		Indian ricegrass	5
		Longleaf hawksbeard	5
		Nevada bluegrass	5
		Threetip sagebrush	5
		Needle and thread	3
Atom	ARTRW8/PSSP6	Bluebunch wheatgrass	30
		Wyoming big sagebrush	25
		Sandberg bluegrass	10
		Thurber needlegrass	10
		Indian ricegrass	5
		Longleaf hawksbeard	5
		Needle and thread	5
		Nevada bluegrass	5
		Threetip sagebrush	5
Pingree	ARTRW8/PSSP6	Wyoming big sagebrush	30
		Sandberg bluegrass	15
		Bottlebrush squirreltail	10
		Antelope bitterbrush	5
		Bluebunch wheatgrass	5
		Lupine (*Lupinus* spp.)	5
		Other annual forbs	5
		Other shrubs	5
		Phlox	5
		Rabbitbrush	5
		Thurber needlegrass	5
		Other perennial forbs	4
		Granite pricklygilia (*Linanthus pungens*)	1

Table 4-2. (continued)

Soil Name	Ecological Site[1]	Characteristic Vegetation	Rangeland Composition[2]
Deuce	ARTRW8/PSSP6	Wyoming big sagebrush	25
		Bluebunch wheatgrass	20
		Sandberg bluegrass	10
		Threetip sagebrush	5
		Thurber needlegrass	5

1 NRCS designation of vegetative community/range site.
2 The percentages in this table will not add up to 100 percent for the ecological site. They are published by NRCS as a guide to what the plant composition could be on an undisturbed range site. The closer the actual plant composition percentages are to the potential percentage, the better the range condition. They are presented here to show the differences in plant composition within the ecological site by soil type.

4.2.7 Invasive Species

In general, areas that are disturbed have a greater potential for invasion by non-native species, including noxious weeds, than do undisturbed areas. Invasive species spread from human settings (gardens, agricultural areas, etc.) into the wild where they reproduce and displace native species, decreasing the native biodiversity and harming native plants and animals. Non-native weeds can displace the native plants that once provided food and shelter for the native animals. When the populations of native plants are reduced, the animals that depend upon them are impacted. Invasive exotic plant species threaten natural diversity, habitat for wildlife and native plants, soil stability, and ecosystem processes.

Noxious weeds, one type of invasive species, have been designated as noxious by state statute (4-022) and are defined in the simplest terms as plant species that are deleterious. Thirty-six species of weeds have been designated as noxious in Idaho (4-017). Noxious weed infestations have been documented along U.S. Highway 26, located north of the Atomic City site, and in the general area surrounding the project area. Species that are known to occur in these areas include spotted knapweed (*Centaurea maculosa*), Russian knapweed (*Centaurea repens*), musk thistle (*Carduus nutans*), and Canada thistle (*Cirsium arvense*) (4-032). Musk thistle is known to occur in five areas south of the Atomic City site and is being treated by the BLM. During the field survey of the project area in February 2007, one isolated population of knapweed was found in the northern part of the project area near BLM managed lands (4-020). Cheatgrass is an invasive species that occurs in the project area that has affected the quality of the habitat Cheatgrass forms dominant stands in sagebrush rangelands and displaces native vegetation. It outcompetes native species for soil moisture and closes communities to the establishment of seedlings of perennial herbaceous species. Additionally, it increases the frequency of and influences when wildfires occur during the spring, summer, and fall (4-037).

4.3 Results

Field surveys to collect relevant information on natural resources for the Atomic City site were conducted from February 14 through February 16, 2007. A crew of six to eight personnel was used each day and included qualified natural resource specialists. Surveys were conducted using parallel pedestrian survey methods with transects spaced 30 meters apart. Plant community types and distributions across the site were noted and dominant species identified. Some plants were unidentifiable to the species level due to the season of the survey. All animal species that were seen during the surveys were also noted. The entire Atomic City site was surveyed using this methodology.

The results of the survey (described below) are not intended to provide a comprehensive listing of all plant and animal species likely to occur at the Atomic City site, but rather to field-verify the background information described above and to examine the Atomic City site carefully for any important plant or animal species or habitat that construction and operation of the GNEP facilities could potentially disturb.

4.3.1 Plant Communities

The majority of the area has been converted to a crested wheatgrass/cheatgrass community. There are indications that crops were planted on the Atomic City site at one time (as evidenced by the amount of old irrigation equipment and ruts), but it has not been in production for many years. The largest area of native range (ARTRW8/PSSP6) that exists on the area is found in the southwest corner between the railroad on the west and south, the main gravel road on the north, and a lava flow on the east. Scattered remnants of the range site are present throughout the remainder of the area, primarily on areas that cannot be cultivated because of lava outcrops and on the corners of the agricultural irrigation pivot areas.

Within the southwest corner and the remnant parcels of sagebrush habitat, the dominant vegetation species included basin and Wyoming big sagebrush, Indian ricegrass, bottlebrush squirreltail, rabbitbrush, broom snakeweed, prickly pear (*Opuntia* spp.), scattered juniper trees (*Juniperus* spp.), and unidentifiable forbs (4-020).

Crested wheatgrass/ cheatgrass community.

Throughout the area, cheatgrass is the co-dominant species. Tumblemustard (*Sisymbrium altissimum*), another weedy species, has infested the southern part of the Atomic City site. Given the time of year surveys were performed, identification of plants was largely dependent upon senescent plant material and standing litter in the project area. Some plants were unidentifiable to the species level due to the season of the survey. Spotted knapweed, a noxious weed, was found at one northern location in the project area near BLM managed lands.

Sagebrush community.

Some fire scarring was present within the sagebrush habitat in the extreme southeast corner of the Atomic City site and was attributed to a past wildland fire. Wildland fires in sagebrush areas are relatively common in southeastern Idaho. Figure 4-3 shows the fire history within the project area from 1971 through 2006. This map uses the base map from Section 1, *Maps*, and is overlaid with the fire perimeter information from USGS (4-044) and BLM (4-045).

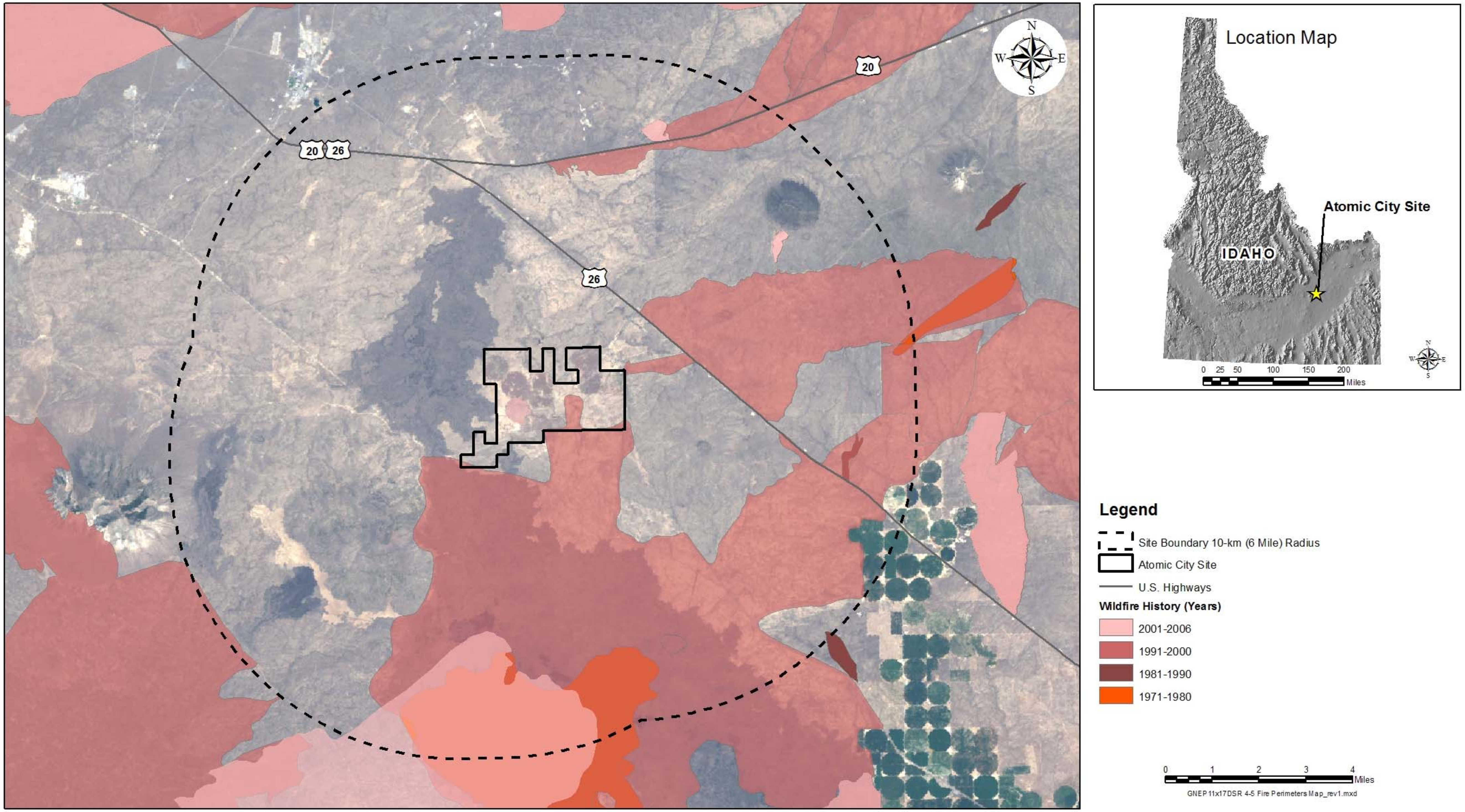

Figure 4-3. Wildfire burn areas around the Atomic City site (4-044, 4-045).

4.3.2 Animal Communities

Tumblemustard/ cheatgrass/annual plant species.

The Atomic City site is in the Big Desert area of the eastern Snake River Plain and is surrounded by sagebrush steppe habitat. Several wildlife species such as elk, deer, pronghorn antelope, coyote, rabbit, and other small rodents, are known to use sagebrush steppe habitat year round (4-020). Pronghorn antelope were observed within the Atomic City site during the field survey. Sagebrush obligate species, such as greater sage grouse and sage sparrow, are species with high public interest. They are also species of concern and are addressed in Section 5, *Threatened or Endangered and Special Concern Species*, with other species of concern.

Other species that were observed during the field survey include sage grouse, black-tailed jackrabbits, small rodents, song birds, and raptors. There are no riparian, wetland, or aquatic habitats present within or directly adjacent to the Atomic City site; therefore, species associated with these habitat types are not anticipated to be found within the project area (see additional discussion in Section 2, *Aquatic and Riparian Ecological Communities*). None of the species identified for this area is critical to the structure and function of the ecosystem or provide a broader ecological perspective of the area primarily due to the small amount of native vegetation that remains on the site.

4.3.2.1 Mammals

Economically important mammals expected, or verified, to be within the boundary of the Atomic City site are discussed below. Domestic animals that use the area are cattle, sheep, and horses (4-020). Cattle graze the area during the spring and summer. Approximately 1,500 head use the area in conjunction with the BLM-managed lands to the south. Five bands of sheep are brought onto the site in the fall and graze into early winter when they move north onto the INL grazing areas. Horses that are used by the sheepherders are also present during this time (4-047).

Elk – The elk population in the Big Desert and Snake River zones has increased substantially from early historical records. Accounts of trappers through this area in the mid-1800s suggest that, although elk were common, buffalo, bighorn sheep, and pronghorn were far more numerous. Unregulated harvests of the late 1800s and early 1900s likely reduced elk populations to relatively low levels (4-007).

The Big Desert Zone represents some of the least productive habitat and the Snake River Zone represents some of the least suitable habitat for elk found in eastern and southern Idaho. Comprised of mostly agricultural lands and dry desert shrub habitat types, the Big Desert Zone and Snake River Zone provide limited summer range for elk. The BLM administers the majority of the public lands in the Big Desert Zone. Other landowners include private individuals and the INL (4-006). The INL, which is largely unavailable for hunting, provides daytime refuge for several hundred elk that forage on private cropland at night. Wildfires continue to affect the quality of habitat throughout the Big Desert and Snake River zones. In many cases, fire has resulted in the replacement of sagebrush stands with perennial grasses, theoretically improving habitat conditions for elk. Population estimates for Game Management Unit (GMU) 68, which lies west and south of the Atomic City site, show that about 140 elk winter within the GMU. IDFG combines this GMU with GMU 52A to become the Big Desert Zone for harvest regulations. Within this zone, the harvest of elk has averaged 29 cows and 33 bulls since 2001, when

IDFG reduced the number of GMUs in this zone and changed to a controlled permit only. Hunter success has been between 26 and 31 percent (4-007). While this is a good hunter success ratio, there are some limits as to how much of the harvest could be applied to the project area.

Indications of elk presence in the project area were observed during the field survey (4-020) but no individual elk were observed. Sign of elk use within the project area was heaviest along the western and southern portions of the project areas near the lava flows and sagebrush communities. Even though the Atomic City site has elk present on it, hunting this population does not substantially contribute to the economy of the state for the following reasons: 1) the Atomic City site constitutes less than one-half of one percent of the Zone acreage, 2) it is private land protected by Idaho trespass laws, 3) the season of use is primarily wintering, 4) the elk have a safe zone immediately north of the area, and 5) the quality of habitat is poor.

Mule Deer – Historically, the mule deer population within Analysis Area 15 (GMUs 52A, 63, 63A, 68, 68A) has been limited due to the low deer productivity of the area. Accounts of trappers through this area in the mid-1800s indicated that buffalo, elk, pronghorn, and bighorn sheep were far more common than mule deer. Given the low density of deer and low priority for deer management in this Analysis Area, little data are available to indicate what population trends have occurred through time (4-021) or to give an overall estimate of the mule deer population.

The area is primarily comprised of dry desert shrub types, thus representing a low food production area. Mule deer periodically create depredation concerns within agricultural zones. Wildfires impact habitat throughout the IDFG analysis area, and, in many cases, fire has replaced climax sagebrush stands with annual and perennial grasses (4-021).

Mule deer share the habitat with livestock, elk, pronghorn, and white-tailed deer within IDFG Analysis Unit 15. It is unknown what impacts an increasing elk population may have on mule deer. Pronghorns are not anticipated to have any impact on mule deer populations (4-021).

Mule deer sign was seen during the field survey primarily along the western and southern boundaries of the Atomic City site (4-020); however, no animals were seen. Habitat use was limited to the western, northern, and southwestern portions of the area near lava flows and sagebrush habitat. Fewer indicators of use were found as distance into the crested wheatgrass seeding increased.

The analysis area falls under the general hunting season for mule deer. It is virtually impossible to relate the mule deer harvest numbers, number of hunters, and hunting success from the Analysis Area 15 information to the Atomic City site. The size of the analysis area (five GMUs) covering southern Idaho from Carey to Heise and Lake Walcott to Arco is the major limiting factor. The conclusion that the Atomic City site does not contribute significantly to the deer population in southern Idaho is evidenced by the following: the analysis area is large, and the Atomic City site is private land protected by Idaho trespass laws; the season of use is primarily winter; the mule deer have a safe zone immediately north of the area; and the quality of habitat is poor.

Pronghorn Antelope – The general area provides winter range for pronghorn antelope that migrate from summer range located to the south and west of the Atomic City site. There are also year-round resident pronghorn antelope found in the vicinity of the Atomic City site (4-023). The area north of the Atomic City site supports a large population of resident pronghorn antelope (4-001, 4-029). During the field survey, six pronghorn antelope were seen within the Atomic City site (4-020). Tracks and droppings were seen throughout the survey area. GMU 68 constitutes the only GMU within IDFG Group 2 Units for pronghorn population and harvest information. The GMU is managed under a controlled permit process; there is no general rifle hunt for antelope. There is an archery antelope season from August 15 to September 15 with no limit to the number of hunters that participate. Rifle hunters, with a controlled hunt permit, have a success rate of 79 percent, and the archers have a success rate of 26 percent.

4.3.2.2 Birds

Bird species typical of the sagebrush steppe were seen during the field survey. These include sage grouse, ferruginous hawk (see Section 5, *Threatened or Endangered and Special Concern Species*, for more complete information and discussion on these two species), horned lark, black-billed magpie (*Pica pica*), short-eared owl (*Asio flammeous*), and northern harrier (*Circus cyaneus*) (4-020). Approximately 230 bird species are known to commonly use habitat in the surrounding area (4-005).

To determine the species that actually use the Atomic City site, additional surveys during the breeding/nesting/brood rearing periods need to be conducted. The crested wheatgrass seeding is not suitable for most nesting birds, but the seeds and insects found within the seeding would be beneficial during the brood rearing period. While the sagebrush area in the southwest corner could receive more use because of the cover that is available.

4.3.2.3 Reptiles

Reptile species were not observed in the Atomic City site due to the time of year the survey was conducted (4-020). Numerous reptile species have been reported in studies conducted immediately north of the Atomic City site (4-001), and it is logical to expect the same species could exist in similar habitats within the area. Although the majority of the Atomic City site has been changed to a crested wheatgrass/cheatgrass community, there are habitats similar to those to the north available on the remnant sagebrush islands and the corners of the Atomic City site with sagebrush. Very few species would reside within the crested wheatgrass/cheatgrass community but could be present during movement to adjacent areas.

Common reptiles that could utilize the area include western rattlesnake (*Crotalus viridis*), short-horned lizard (*Phrynosoma douglassi*), leopard lizard (*Gamebia wislinzenii*), sagebrush lizard (*Sceloporus graciosus*), gopher snake (*Pituophis melanoleucus*), racer (*Coluber constrictor*), ringneck snake (*Diadophis punctatus*), night snake (*Hypsiglena torquata*), and common garter snake (*Thamnophis sirtalis*) (4-001).

Uncommon or rare reptiles include western skink (*Eumeces skiltonianus*), rubber boa (*Charina bottae*), desert striped whipsnake (*Masticophis taeniatus*), western terrestrial gopher snake (*Thamnophis elegans*), and Mojave black-collared lizard (*Crotaphytus bicinctores*). The ranges for these species overlap the Atomic City site (4-001), but there are no observations of these species on the INL or on the project area.

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* Indicates those sources considered but not cited.

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TABLES

5. THREATENED OR ENDANGERED AND SPECIAL CONCERN SPECIES

This section describes threatened or endangered and special concern species occurring within or near the Atomic City site that have the potential to be disturbed by construction and operation of the GNEP facilities. Section 2, *Aquatic and Riparian Ecological Communities*, describes any aquatic communities, including fish and shellfish, commercial and sport fisheries, and riparian communities at or near the Atomic City site. Special status species (i.e., species covered under the ESA (5-017) or of special concern to other federal, state, or local agencies), including any aquatic or riparian habitat related species, are discussed in this section. More detailed information on general plant and animal communities that occur at the Atomic City site is provided in Section 4, *Critical and Important Terrestrial Habitats*. The base information for maps presented in this section originates from Section 1, *Maps*. Overlay map data associated with the specifics of this section will be referenced as appropriate.

5.1 Overview and Summary

Literature and field surveys to identify threatened, endangered, or special concern species in or near the Atomic City site identified a limited number of species that have habitat in or near the project area. In Butte and Bingham Counties, 66 listed or special concern species exist. Two special concern species are known to occur on the Atomic City site (sage grouse and ferruginous hawk). Some species have the potential to occur while suitable habitat for the remainder of the 66 species is not present on the Atomic City site, or the area within 10 kilometers (6 miles).

No federally listed species are present on the Atomic City site because their habitat requirements are not met.

The following are the special concern species:

- Sage grouse. The sagebrush habitat on the project area is limited to the southwest corner and the northern and western edges. Sage grouse were seen during the field survey, but the sagebrush is very fragmented and limited.

- Ferruginous hawk, Prairie falcon, and Townsend's big-eared bat. These species may use the area for foraging, but nesting and roosting habitat is not available on site. Ferruginous hawks were seen during the field survey hunting in the vicinity of the Atomic City site.

Additional surveys need to occur to verify the presence of the following species on the Atomic City site: Western burrowing owl (*Athene cunicularia*), grasshopper sparrow (*Ammodramus svannarum*), loggerhead shrike (*Lanius ludovicianus*), sage sparrow (*Amphispiza belli*), Brewer's sparrow (*Spizella passerine*), pygmy rabbit (*Brachylagus idahoensis*), Piute ground squirrel (*Spermophilus mollis*) and Merriam's shrew (*Sorex merriamii*).

Plant surveys during plant growth and flowering need to occur to verify the presence or absence of the following plant species of special concern: Lavender ipomopsis (*Spreading gilia*) (*Ipomopsis polycladon* [*Gilia polycladon*]), Lemhi milkvetch (*Astragalus aquilonius*), wingfruit suncup (*Cammissonia pteropsperma*), and green needlegrass (*Nassella viridula* [*Stipa viridula*]). Conversion of the native range to crested wheatgrass severely limits the potential for these species.

5.2 Background

This section provides a summary of pertinent regulatory information, a list of the special status species known to occur in Butte and Bingham Counties and species of concern to the Idaho Falls District of the BLM, and a description of the field methodology. This section also discusses threatened or endangered and species of concern identified on the site or within 10 kilometers (6 miles) of the Atomic City site. Habitat and species information is presented for these species.

5.2.1 Regulatory Requirements

The ESA (5-017) is Federal legislation intended to provide a means to conserve the ecosystems upon which endangered and threatened species depend and programs for the conservation of those species, thus preventing extinction of plants and animals. Depending on the type of species being protected, the law is administered by the USFWS or National Marine Fisheries Service (NMFS). Section 7 of the ESA requires all Federal agencies, in consultation with USFWS or NMFS, to use their authorities to further the purpose of the ESA and to ensure that their actions are not likely to jeopardize the continued existence of listed species or result in destruction or adverse modification of critical habitat.

The interagency cooperation requirements of Section 7(a)(2) of the ESA are to be carried out in consultation with the Secretary of the Interior via the USFWS. The need to initiate consultation is usually determined by the governing Federal agency, which in the case of the proposed project is the DOE, and is based on an analysis to determine if an individual of a federally listed species, or its designated critical habitat, may be affected by a proposed action. The DOE must initiate consultation if a listed species is known, or suspected, to occur on land that will be affected by an action, and the DOE determines that individuals, populations, or designated critical habitat of threatened or endangered species may be affected by the action, either positively or negatively.

There are three designations given to species under ESA that offer protection to plants and animals that have been found to warrant protective measures to ensure their survival and existence (5-017). These designations are that of endangered, threatened, or candidate species. An endangered species is an animal or plant species in danger of extinction throughout all or a significant portion of its range; a threatened species is an animal or plant species likely to become endangered within the foreseeable future throughout all or a significant portion of its range; and a candidate species is a plant or animal species for which the USFWS or NMFS has on file sufficient information on biological vulnerability and threats to support a proposal to list the species as endangered or threatened.

A species of concern is an informal term used by the USFWS and NMFS as well as other government agencies (e.g. BLM and IDFG). It refers to a species that might be in need of conservation action or that is considered sensitive, rare, or declining on lists maintained by Natural Heritage Programs, state wildlife agencies, other Federal agencies, or professional/academic scientific societies. The need may range from periodic monitoring of populations and threats to the species and its habitat, to listing of a species as endangered or threatened. Such species receive no legal protection, and use of the term does not necessarily imply that a species will eventually be proposed for listing. Due to the close proximity of lands managed by the BLM Upper Snake River Field Office, species of concern identified by the BLM are discussed within this document.

The ESA requires the federal government to designate “critical habitat” for any species it lists is defined as: 1) specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to conservation, and those features may require special management considerations or protection; and 2) specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation (5-015).

BLM Policy Manual 6840 states that: "The BLM shall manage species proposed for listing as threatened or endangered and proposed critical habitat with the same level of protection provided for listed species and designated critical habitat except that formal consultations are not required. The protection provided by the policy for candidate species shall be used as the minimum level of protection for BLM sensitive species" (5-025).

Additional major legislation requiring actions by Federal agencies to protect threatened and endangered species, as well as other protected, non-federally listed species and habitats, include but are not limited to the following:

- Fish and Wildlife Conservation Act of 1980,
- Bald and Golden Eagle Protection Act as amended in 1962,
- Fish and Wildlife Coordination Act of 1958,
- Migratory Bird Treaty Act of 1918 as amended, and
- Plant Protection Act of 2000.

The State of Idaho manages the wildlife populations of the state through the IDFG. Idaho Statutes under Title 36, Fish and Game, deal with the species of wildlife in the state (5-031). The Idaho Fish and Game Commission has the authority under 36-201 to classify wildlife including endangered or threatened wildlife (f), protected (g) and unprotected (h) species.

5.2.2 List of Special Status Species

A current list of the endangered, threatened, and candidate species, species of concern, and any designated critical habitat, for Butte and Bingham Counties, Idaho, was obtained from the USFWS (5-014) and the BLM for Species of Special Concern (5-030). These lists contain a total of 66 listed or sensitive species (two endangered species, four threatened species, one candidate species, and 59 species of concern) known or suspected to occur within Butte and Bingham Counties (Table 5-1). The federally listed endangered species are the gray wolf (Experimental Nonessential population) and the Utah valvata snail. The threatened species are the bald eagle, Ute ladies'-tresses, Canada lynx, and bull trout. The candidate species is the yellow-billed cuckoo (5-001, 5-026, 5-028). Critical habitat for bull trout has been proposed in Butte County, but no formally designated critical habitat has been identified within or near the Atomic City site (5-015); thus, critical habitat for these species is not an issue for the Atomic City site.

Table 5-1. Special status species for Bingham and Butte Counties and the Idaho Falls District BLM.

Common Name	Scientific Name	Group	Status*
Species Known to Occur on the Atomic City Site			
Greater sage grouse	*Centrocercus urophasianus*	Bird	SSC (CA)
Ferruginous hawk	*Buteo regalis*	Bird	SSC
Species that Could Potentially Occur within the Atomic City Site			
Western burrowing owl	*Athene cunicularia*	Bird	SSC
Grasshopper sparrow	*Ammodramus savannarum*	Bird	SSC
Loggerhead shrike	*Lanius ludovicianus*	Bird	SSC
Sage sparrow	*Amphispiza belli*	Bird	SSC
Brewer's sparrow	*Spizella breweri*	Bird	SSC
Prairie falcon	*Falco mexicanus*	Bird	SSC
Pygmy rabbit	*Brachylagus idahoensis*	Mammal	SSC
Townsend's big-eared bat	*Corynorhinus townsendii townsendii*	Mammal	SSC
Piute ground squirrel	*Spermophilus mollis*	Mammal	SSC
Merriam's shrew	*Sorex merriami*	Mammal	SSC
Lavender ipomopsis (Spreading gilia)	*Ipomopsis polycladon* (*Gilia polycladon*)	Plant	SSC
Wingfruit suncup (Winged-seed evening-primrose)	*Camissonia pterosperma*	Plant	SSC
Lemhi milkvetch	*Astragalus aquilonius*	Plant	SSC
Green needlegrass	*Stipa viridula*	Plant	SSC
Species that Occur within the General Geographic Area but do not Have Suitable Habitat within the Atomic City Site			
Common garter snake	*Thamnohis sirtalis*	Reptile	SSC
Bull trout	*Salvelinus confluentus*	Fish	T (CA)
Westslope cutthroat	*Oncorhynchus clarki lewisi*	Fish	SSC
Yellowstone cutthroat	*Oncorhynchus clarki bouveri*	Fish	SSC
Western toad	*Bufo boreas*	Amphibian	SSC
Northern leopard frog	*Rana pipens*	Amphibian	SSC
Bald eagle	*Haliaeetus leucocephalus*	Bird	T
Yellow-billed cuckoo	*Coccyzus americanus*	Bird	C

Table 5-1. (continued).

Common Name	Scientific Name	Group	Status*
Flammulated owl	*Otus flammeolus*	Bird	SSC
Northern goshawk	*Accipiter gentilis*	Bird	SSC
Black-backed woodpecker	*Picoides arcticus*	Bird	SSC
Lewis' woodpecker	*Melanerpes lewis*	Bird	SSC
Columbia sharp-tailed grouse	*Tympanuchus phasianellus columbianus*	Bird	SSC
Black tern	*Chlidonias niger*	Bird	SSC
White-faced ibis	*Plegardis chihi*	Bird	SSC
Willow flycatcher	*Empidonax traillii*	Bird	SSC
Trumpeter swan	*Cygnus buccinator*	Bird	SSC
Gray wolf	*Canis lupus*	Mammal	E/EN
Canada lynx	*Lynx candensis*	Mammal	T (CA)
Wolverine	*Gulo gulo*	Mammal	SSC
Cliff chipmunk	*Tamias umbrinus*	Mammal	SSC
Utah valvata snail	*Valvata utahensis*	Mollusk	E
Ute ladies'-tresses	*Spiranthes diluviali*	Plant	T
Obscure phacelia	*Phacelia inconsipicua*	Plant	SSC
Tufted milkvetch (Plains milkvetch)	*Astragalus gilviflorus*	Plant	SSC
Welsh's buckwheat	*Eriogonum capistratum*	Plant	SSC
Saint Anthony evening-primrose	*Oenothera psammophila*	Plant	SSC
Rolland's bulrush	*Scirpus rollandii*	Plant	SSC
Two-headed onion (Twin leaf onion)	*Allium anceps*	Plant	SSC
Lost River milkvetch	*Astragalus amnis-amissi*	Plant	SSC
Meadow milkvetch	*Astragalus diversifolius*	Plant	SSC
Picabo milkvetch	*Astragalus oniciformis*	Plant	SSC
Western sedge	*Carex occidentalis*	Plant	SSC
Sepal-toothed dodder	*Cuscuta denticulata*	Plant	SSC
Chatterbox orchid	*Epipactis gigantea*	Plant	SSC
Marsh felwort	*Lomatogonium rotatum*	Plant	SSC

Table 5-1. (continued).

Common Name	Scientific Name	Group	Status*
Green muhly	*Muhlenbergia racemosa*	Plant	SSC
Small-flowered ricegrass	*Piptatherum micranthum*	Plant	SSC
Alkali primrose	*Primula alcalina*	Plant	SSC
Rush aster	*Aster junciformis*	Plant	SSC
Two-grooved milkvetch	*Astragalus bisulcatus*	Plant	SSC
Drummond's milkvetch	*Astragalus drummondii*	Plant	SSC
Hoary willow	*Salix candida*	Plant	SSC
Spaldings' silene	*Silene spaldingii*	Plant	SSC
Cushion cactus	*Coryphantha vivipara* (*Escobaria vivipara*)	Plant	SSC
Salmon twinbladderpod	*Physaria didymocarpa* var. *lyrata*	Plant	SSC
Payson's milkvetch	*Astragalus paysonii*	Plant	SSC
Dwarf gray rabbitbrush	*Chrysothamnus nauseosus* var. *nanus*	Plant	SSC
Swamp willow-herb	*Epilobium palustre*	Plant	SSC
Hall's rush	*Juncus hallii*	Plant	SSC

*Status

E Endangered, any species which is in danger of extinction throughout all or a significant portion of its range.

EN Experimental nonessential, the population is not essential to the continued existence of the species.

T Threatened, any species which is likely to become an endangered species within the foreseeable future throughout all or
a significant portion of its range.

C Candidate, taxa for which the USFWS has sufficient information to propose that they be added to list of endangered and threatened species, but the listing action has been precluded by other higher priority listing activities.

CA Conservation Agreement, an agreement between agencies or an agency and private landowners that outlines what will be done to protect a species so the likelihood of that species being listed is reduced.

SSC Species of Concern, taxa for which further biological research and field study are needed to resolve their conservation status or are considered sensitive, rare, or declining on lists maintained by Natural Heritage Programs, State wildlife agencies, other Federal agencies, or professional/academic scientific societies. Species of Concern are included for planning purposes only.

5.2.3 Field Survey Methodology

A field survey was conducted from February 14 through February 16, 2007, to determine habitat types present within the Atomic City site and to assess the suitability of the habitat present for the ESA listed and BLM special status species that have been identified as occurring in the area (Table 5-1). The survey was conducted by walking transects throughout the Atomic City site at 30-meter intervals. Information was collected on the vegetation types present within the Atomic City site and general wildlife observed during the surveys.

5.3 Species Descriptions and Results

This section provides a brief description of the species listed in Table 5-1 that are likely to occur in or near the Atomic City site based on ecological sites and habitat present, and summarizes the results of the literature search and field survey. Sixty-six special status species were identified as occurring in Butte and Bingham Counties (Table 5-1); of these, two species are known to occur on the Atomic City site (5-019).

5.3.1 Species Known to Occur on the Atomic City Site

Sage grouse and ferruginous hawks were seen during the field survey of the Atomic City site. The sagebrush habitat is fragmented and may not be the best for sage grouse, and ferruginous hawks were hunting in the vicinity of the Atomic City site.

Sage grouse

Sage grouse.
Credit: Tom Remington;
http://wildlife.state.co.us/WildlifeSpecies/Profiles/Birds

The sage grouse is a special species of concern, and a conservation agreement between state and federal agencies has been written for the species (5-035). The importance of the sage steppe habitat and the close proximity of the INL, with its relatively undisturbed habitat, has lead to much research being done in the area, specifically on sage grouse and other sagebrush obligates. Populations of sage grouse are allied closely with sagebrush, and they are found in foothills, plains, and mountain slopes where sagebrush is present, or in a mixture of sagebrush, meadows, and aspen. They feed on sagebrush during winter and on sagebrush as well as leaves, blossoms, and buds of associated plants at other times of the year. They build concealed nests in depressions on the ground under vegetative cover. Most nests occur under sagebrush, but sage grouse will also nest under other plant species, although not as successfully. In general, nests are placed under shrubs with larger canopies and more ground and lateral cover, as well as in stands with more shrub canopy cover. Grass height and cover is also important for nest sites, with taller and denser grass being preferred. Sage grouse forage in foliage or on the ground. The sage grouse is a lek breeder; up to 400 males may display in an area one-half mile long. Leks, which are breeding display sites, typically occur in open areas that are surrounded by sagebrush, such as roads, cropland, burned areas, landing strips, low sagebrush flats, and ridge tops. In an Idaho study, nesting success was higher in sites with sagebrush versus those without (5-042).

The ecological condition of many western sagebrush rangelands has been degraded for several reasons, and the overall decrease in the Big Desert sage grouse population has been attributed to some of these same factors, including drought, fire, and associated habitat fragmentation. Active leks have been shown to decline following burns and breeding population declines have also been noted following fire. Alternately, disturbed sites have been observed to be used for leks, but disturbance is not a guarantee that new leks will be formed (5-042).

Past fires in the area surrounding Atomic City have resulted in a decrease in sagebrush and an increase in cheatgrass, thereby reducing the amount of suitable habitat (Figure 5-1). This map uses the base map from Section 1, *Maps*, and is overlaid with the wildland fire perimeters from the USGS (5-045) and the BLM (5-046). The information from IDFG, Conservation Data Center, is also overlaid on the map (5-044). The habitat in the area around Atomic City is considered to be too fragmented and does not represent a critical use area for sage grouse (5-040). The areas north of Atomic City represent better habitat and, although not currently monitored, observations of several leks have been made. One known lek occurs approximately 2 miles northwest of Atomic City, but no leks occur in the Atomic City site. However, this species is known to occur within the project area based on observations during the field survey (5-019) and the surrounding area. The sage grouse is used as an umbrella species, assuming that habitat needs for other sagebrush obligate species are similar (5-040). The sagebrush habitat on the project area is limited to the southwest corner and the northern and western edges.

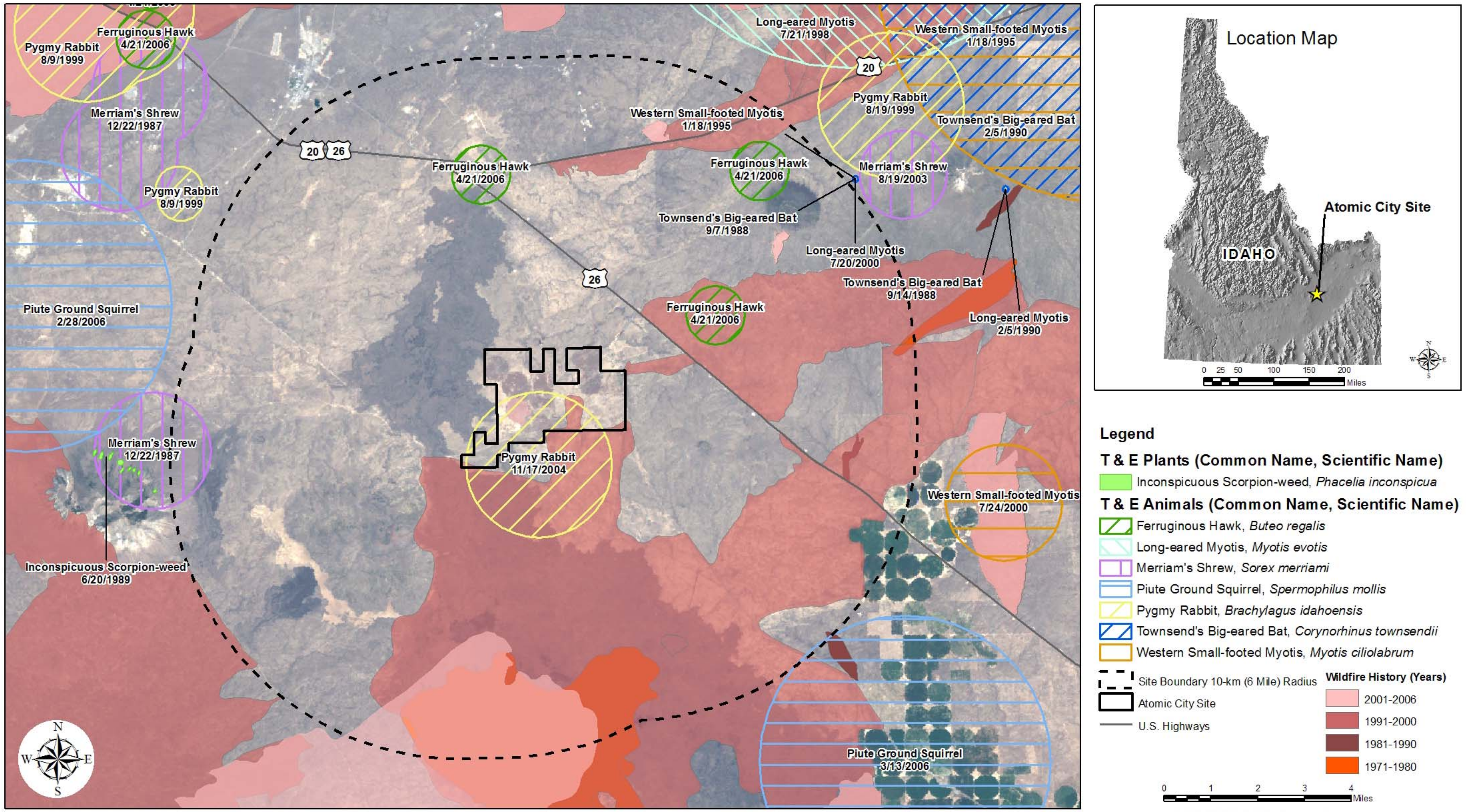


Figure 5-1. Wildfire burn areas in relationship to endangered, threatened, or special concern species at the Atomic City site (5-005, 5-006, 5-007, 5-008, 5-044, 5-045, 5-046).

Ferruginous hawk

The ferruginous hawk breeds from eastern Washington, southern Alberta, southern Saskatchewan, and southwestern Manitoba, south to eastern Oregon, Nevada, Arizona, New Mexico, north-central Texas, western Oklahoma, and western Kansas. The ferruginous hawk commonly migrates south in fall, but resides in limited numbers in the southern part of the state. They are often found in shrub steppe habitat at the edge of pinyon/juniper communities or other woodlands. They build their nests in trees or on cliffs, and hunt from the air or from a perch. Humans easily disturb individuals during early nesting season (5-021). Ferruginous hawks are known to occur in the sagebrush steppe habitat of the Big Desert, and a known nest occurs two miles east northeast of Atomic City (5-001). A dead immature ferruginous hawk was found on the southern portion of the project area (5-019). The cause of death was not determined. Based on the habitat requirements for ferruginous hawks, they likely use the Atomic City site for hunting. It is unlikely that any nests occur in the Atomic City site area.

Ferruginous hawk.
Credit: Snake River Birds of Prey National Conservation Area
http://www.birdsofprey.blm.gov/photos/

5.3.2 Species with Potential to Occur on the Atomic City Site

Six birds, four mammals, and four plant special concern species have the potential to occur on the Atomic City site. Each species is presented with a discussion of their habitat needs.

5.3.2.1 Birds

The following bird species potentially occur within the project area due to presence of suitable habitat: western burrowing owl, grasshopper sparrow, loggerhead shrike, sage sparrow, Brewer's sparrow, and prairie falcon. The habitat requirements for each of the special status bird species is discussed in greater detail below, and the probability of occurrence within the site is considered. The presence of marginal or suitable habitat does not ensure that the species occur within or adjacent to the Atomic City site**.**

Western burrowing owl

In the U.S., the burrowing owl is identified as a Candidate species by the USFWS. In Idaho, the burrowing owl's conservation status is considered to be imperiled, and it is on the BLM's Watch List as a species that may warrant designation as a species of special concern (5-027). The western burrowing owl is a breeding resident on the INL. The majority of owls and nest sites located within the INL have been in grazed and ungrazed crested wheatgrass and native grass areas (5-009). Because the owls migrate in the winter and do not return to the INL until mid-March (5-020), no owls were located during the field survey. Numerous badger dug burrows are available for nesting burrowing owls within the Atomic City site (5-019). Habitat for breeding burrowing owls does exist on the project area and their presence during the breeding season needs to be confirmed.

Western burrowing owl.
Credit:
http://www.cerc.usgs.gov/frs_webs/gulf_coast/owls.htm

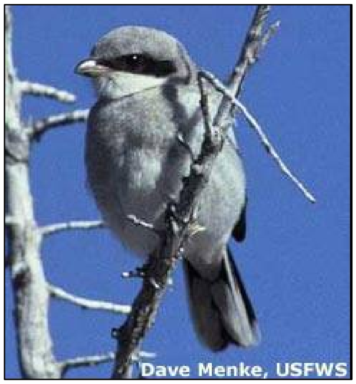
Grasshopper sparrow

The grasshopper sparrow breeds from eastern Washington and southern British Columbia, east across portions of Canada and the U.S. to Maine, and south to southern California, New Mexico, southern Texas, southeastern Arizona, and portions of northern Mexico and the southeastern U.S. The grasshopper sparrow is most commonly found in prairies, old fields, open grasslands, cultivated fields, and savannas. They build their nests on the ground (5-021). Based on habitat requirements for this species, the potential exists for them to occur in the project area.

Grasshopper sparrow.
Credit: Dave Menke, USFWS

Loggerhead shrike

The loggerhead shrike breeds across portions of Canada, south through the Great Basin to Baja California, Mexico, the Gulf Coast, and southern Florida. They are often found in open country with scattered trees and shrubs, in savannas, desert scrub, and occasionally, in open juniper woodlands. The loggerhead shrike constructs bulky, cup-shaped nest in shrubs. A study in southeastern Idaho located most nests in sagebrush, and fewer in bitterbrush and greasewood (5-021, 5-022). Based on habitat requirements for this species, the potential exists for them to occur in the project area.



Loggerhead shrike.
Credit: Dave Menke, USFWS; http://www.dnr.state.wi.us/org/land/er/factsheets/birds/shrike.htm

Sage sparrow

The sage sparrow breeds from central Washington, eastern Oregon, southern Idaho, and southwestern and northwestern Colorado, south to southern California, central Baja California, southern Nevada, southwestern Utah, northeastern Arizona, and northwestern New Mexico. The sage sparrow is primarily found in sagebrush, saltbush brush lands, and chaparral communities. During migration and in winter, they may also be found in arid plains with sparse bushes, in grasslands, and in open habitats with scattered brush. They usually build their nests in sagebrush and an Idaho study found the species prefers large, living sagebrush for nesting (5-021). Based on habitat requirements for this species, the potential exists for them to occur in the project area. However, the sagebrush habitat in the project area is limited to the southwest corner and the edge of the northern boundary.

Sage sparrow.
Credit: Montana Fish, Wildlife & Parks in Partnership with Montana Natural Heritage Program

Brewer's sparrow

Brewer's sparrow.
Credit:http://naturespics.online.com

Brewer's sparrows breed across portions of western Canada and southwestern North Dakota, south to southern California, southern Nevada, central Arizona, and northwestern New Mexico. They are usually found in association with sagebrush communities, and Idaho studies have found that Brewer's sparrows prefer large, living sagebrush for nesting (5-021). A recent study in southwestern Idaho concluded that both local vegetation cover and landscape-level features such as patch size influenced their distribution (5-021). In Idaho, Brewer's sparrows have been observed to build nests in sagebrush between 20 and 50 centimeters high (8 and 20 inches) or in low trees. They forage primarily on the ground. Dense populations may occur in sagebrush habitat. Based on habitat requirements for this species, the potential exists for them to occur in the Atomic City site area. However, the sagebrush habitat in the Atomic City site is limited to the southwest corner and the edge of the northern boundary.

Prairie falcon

Prairie falcon.
Credit: Snake River Birds of Prey National Conservation Area
http://www.birdsofprey.blm.gov/img/falcon10.jpg

The prairie falcon breeds from southeastern British Columbia, southern Alberta, southern Saskatchewan, and northern North Dakota, south to Baja California, parts of southwestern U.S., and northern Mexico. They are found in open situations in mountainous shrub steppe or grasslands areas. In Idaho, they breed in shrub steppe and dry mountainous habitat and winter at lower elevations. They nest on cliffs or sometimes in old raptor nests (5-021). Prairie falcons are known to occur in the sagebrush steppe habitat of the Big Desert area. Based on their habitat requirements, they may occur in the project area. It is unlikely that any nests occur in the Atomic City site, but they may fly over the area when hunting.

5.3.2.2 Mammals

The pygmy rabbit was determined to have suitable habitat occurring within the Atomic City site, and Townsend's big-eared bat may use the area as a foraging site. Piute ground squirrel and Merriam's shrew may be present. The presence of marginal or suitable habitat does not ensure that the species occur within or adjacent to the Atomic City site**.**

Pygmy rabbit

Pygmy rabbit.
Credit: www.fws.gov/easternwashington/Recovery.html

The pygmy rabbit is a special species of concern in Idaho (5-004). The range of the pygmy rabbit is limited from the Great Basin (with an isolated population in east-central Washington), north to extreme southwestern Montana, in the high plains between 4,500 and 7,000 feet. They are typically found in dense stands of big sagebrush growing in deep, loose sediment. They are closely associated with large stands of sagebrush and prefer areas of tall, dense sagebrush cover with a high percent of woody cover. In Idaho, big sagebrush is their primary food source, but grasses and forbs are eaten in mid- to late summer. They use a burrow system, and the entrances of their burrows are often located at the base of sagebrush (5-021). This species was observed in 1976 immediately south of Leo Rogers-1 1 near the railroad (5-001). This area has been repeatedly burned by wildfires since that time, virtually eliminating the large sagebrush plants necessary for the rabbit (Figure 5-1). The cross-hatched areas on the map represent buffer zones around the species occurrence report from the Conservation Data Center (5-001); they may not represent an area occupied by the species. The sagebrush habitat in the project area is considered to be too fragmented to provide good habitat for sagebrush-obligate species such as the pygmy rabbit; however, additional surveys are needed for this species.

Townsend's big-eared bat

Townsend's big-eared bat.
Credit: www.ut.blm.gov

The Townsend's big-eared bat is a special species of concern in Idaho (5-001). They can be found in British Columbia, east through Montana, south into western South Dakota, Nebraska, Kansas, Oklahoma and Texas, south into Mexico and along the Pacific Coastal States of California, Oregon, and Washington. In Idaho, this bat has been collected or observed in hibernacula sites in 17 counties, including Bingham County. Townsend's bats occur in a variety of habitats, from desert shrub to deciduous and coniferous forests at a wide range of elevations. In Idaho, some individuals likely migrate to over-wintering sites and disperse to forested areas during summer when the sexes separate. This species is captured or observed in abandoned mines and both unoccupied and actively used old buildings. The species occasionally uses buildings, bridges, and tree cavities for night roosts. They forage near foliage of trees and shrubs, usually at night (5-021). Caves and/or lava tubes were not located on the project area. There are some old potato cellars on the northeast corner of the area; however, no bats were observed during the field survey.

Piute ground squirrel

The Conservation Data Center reports that the Piute ground squirrel was located immediately adjacent to the southeastern edge of the 10-kilometer (6-mile) radius in 2006 (Figure 5-1 [5-001]). This ground squirrel is a special concern species and is very similar to the Townsend's ground squirrel (*Spermophilus townsendii*) differing only in chromosome number and location. The Townsend's ground squirrel is the most common ground squirrel in southeastern Idaho and is an unprotected nongame species (5-021). Ground squirrels are most abundant around agricultural areas and may be present on the Atomic City site. They are underground for seven to eight months of the year, emerging in the spring from winter hibernation and going back underground during the hot summer months. They come out again in the fall but retreat back underground to avoid the cold winters. Additional spring and fall surveys, collection of individuals, and chromosome analysis are needed to determine the presence of the Piute ground squirrel on the Atomic City site.

Merriam's shrew

Merriam's shrew has been identified by the Conservation Data Center as a special species of concern and present adjacent to the Atomic City site (5-001). It is found in grasses associated with sagebrush from 600 feet to 9,800 feet in elevation and is probably more common than originally thought (5-021). Suitable habitat occurs on the southwest corner and the northern edges of the Atomic City site. Additional surveys are needed to determine the presence or absence of this species.

5.3.2.3 Plants

Four plant special concern species may be present on the Atomic City site; however, native range conversion to crested wheatgrass severely limits the potential for these species.

Lavender ipomopsis (Spreading gilia)

Spreading gilia is a special species of concern (5-020). The lavender ipomopsis generally occurs in dry, open places in the foothills and valleys with sagebrush and sometimes saltbush toward the north, with blackbrush toward the south part of the range, or with creosote bush southward. The species is known to occur throughout most of Nevada and Utah and adjacent parts of Colorado, and less commonly north to the Snake River Plain (5-016). There are isolated parcels of sagebrush steppe habitat that occur throughout the Atomic City site that provide potentially suitable habitat for this species.

Spreading gilia.
Credit: BLM, Lower Snake River District; Duane Atwood

Wingfruit suncup

The wingfruit suncup is a special species of concern and generally occurs in dry, open slopes, ridges, and washes in the sagebrush and pinyon-juniper zones. It occurs between 2,800 and 8,530 feet in elevation. Most known Idaho populations occur on gravelly/silty soils on southerly facing limestone slopes. It is also known to occur in volcanic-derived substrates in a few places. The vegetation is dominated by open Utah juniper, low sagebrush, or black sagebrush communities. It has been identified on the Snake River Plain in Butte County, Idaho, with one location approximately 9 miles west of Atomic City (5-016). There are isolated parcels of sagebrush steppe habitat that occur throughout the site that provide potentially suitable habitat for this species.

Lemhi milkvetch

The Lemhi milkvetch is localized to east-central Idaho and colonies have been identified in Custer, Butte, and Lemhi Counties. It is generally found on unstable steepbanks, sandy washes, and gullies within the shrub-steppe zone at lower elevations (5-016). Conversion of the project area to a crested wheatgrass seeding has reduced the possibility of Lemhi milkvetch presence in the area; however, there are isolated parcels of undisturbed sagebrush steppe habitat that occur throughout the site that provide potentially suitable habitat for this species.

Green needlegrass

Green needlegrass is a special species of concern (5-030). The range of green needlegrass is predominately east of the continental divide. It is native to the northern and central Great Plains from Alberta and Saskatchewan to as far south as Kansas in the east and Arizona in the west. In Idaho it is known from two stations, one near Soda Springs in Caribou County, the other near the head of Warm Springs Creek in Clark County. Its habitat consists of plains, prairies, and foothills at lower elevations, to mountain meadows, open woodlands and hillsides at higher elevations (5-016). Conversion of the project area to a crested wheatgrass seeding has reduced the possibility of green needlegrass presence in the area.

Green needlegrass.
Credit: www.nps.gov/archive/wica/Green_Needle_Grass.htm

5.3.3 Species That Occur within the General Geographic Area but do not have Suitable Habitat within the Atomic City Site

The remaining listed species and special species of concern are not present on the Atomic City site because their habitat requirements are not met including the federally listed species, bull trout, bald eagle, yellow-billed cuckoo, gray wolf, Canada lynx, and Utah valvata snail. Only these species are discussed in detail below.

5.3.3.1 Fish, Amphibians, and Reptiles

There are no fish or amphibian species within the project area because there is no perennial or ephemeral water source. Bull trout is the only federally listed fish species in Butte or Bingham Counties (Table 5-1). Because there is no perennial or ephemeral water source on the site, there is no habitat present for bull trout, nor is there any critical habitat present on the site. Common garter snakes are usually found in association with water and are not present on the Atomic City site (5-021). Other reptiles are present in the area surrounding the project area, and it is reasonable to expect the same species in the same habitats within the Atomic City site. The exact species present will have to be confirmed during the spring or summer since the field survey was completed during the winter (5-019).

5.3.3.2 Birds

Two federally listed bird species (bald eagle and yellow-billed cuckoo) have been identified by the USFWS as being present in Butte and Bingham Counties.

Bald eagle

The bald eagle was originally listed as endangered on March 11, 1967. In 1995, its designation was changed to threatened in the lower 48 states (5-047), and in 1999, the bald eagle was proposed for delisting (5-048). Once delisted from the ESA, bald eagles will continue to be protected by the Bald and Golden Eagle Protection Act as amended in 1962 and the Migratory Bird Treaty Act of 1918. Both acts protect bald eagles by prohibiting killing, selling, or otherwise harming eagles, their nests, or their eggs. The Bald and Golden Eagle Protection Act also protects eagles from disturbance.

The bald eagle frequents estuaries, large lakes, reservoirs, major rivers, and some seacoast habitats that have an adequate food base, perching areas, and nesting sites. In winter, bald eagles are known to congregate at specific wintering sites that are generally close to open water and that offer good perch trees and night roosts (5-014). Winter populations of bald eagles occur on the northern part of the INL (5-023), and they have occasionally been observed in the summer when water is present. There is a potential for the Atomic City site to be used as bald eagle winter foraging areas, however this is unlikely. They have been observed along the Snake River near Blackfoot, approximately 30 miles southeast of the project area. Eagles may be sighted occasionally near the Atomic City site, but due to the distance from water, the project area does not provide good habitat. There are no bald eagle nesting territories in or near the Atomic City site (5-026, 5-028).

Bald eagle. Credit: USFWS

Yellow-billed cuckoo

Listing of the yellow-billed cuckoo as endangered or threatened was found to be warranted, but was precluded by higher priority listing actions on July 25, 2001 (5-028). They are currently designated as a Candidate species in the western U.S., including Idaho. The yellow-billed cuckoo is a neotropical migrant species that is considered an obligate riparian nester that breeds only in streamside forests, especially if willow and cottonwood stands are dominant. Most nesting in the west occurs within relatively large patches of riparian forest (25-100 acres). When they are not breeding, they are found in open woodland with thick undergrowth and deciduous riparian woodlands. They prefer mature cottonwood-willow forests and are dependent upon a dense willow understory and cottonwood overstory. Yellow-billed cuckoo may occur in Bingham County, but nesting occurs almost exclusively close to water (5-028). There is no suitable habitat for yellow-billed cuckoo in the Atomic City site.

Yellow-billed cuckoo. Credit: www.answers.com/topic/cuckoo

5.3.3.3 Mammals

Two federally listed mammal species (gray wolf and Canada lynx) are known or suspected to reside or occur within Butte and Bingham Counties (Table 5-1). These species and their habitat requirements are discussed below to determine the probability of occurrence within the site.

Gray wolf

The gray wolf was listed as endangered in 1967 and, in November 1994, the USFWS issued final rules for the establishment of a nonessential experimental population of gray wolves in Yellowstone National Park and in central Idaho and southwestern Montana (5-043). Within the central Idaho area, the nonessential experimental population areas are those portions of Idaho south of Interstate 90 and west of Interstate 15. Gray wolf numbers have been drastically reduced throughout much of their range due largely to human activity.

In general, gray wolves are found in large tracts of land with a low probability of human encounter. Wolf sightings are common in Yellowstone National Park, which is located approximately 125 miles northeast of the project area. No gray wolf denning sites or rendezvous areas are found near or within the project area (5-019). Habitat within the Atomic City site is not suitable for wolves.

Canada lynx

The Canada lynx is a medium-sized cat with long legs, large, well-furred paws, long tufts on the ears, and a short, black-tipped tail. In the contiguous U.S., Canada lynx inhabit a mosaic between boreal forests and subalpine coniferous forest or northern hardwoods. Canada lynx are specialized predators that are highly dependent on the snowshoe hare (*Lepus americanus*) for food. Snowshoe hare prefer diverse, early successional forests with stands of conifers and shrubby understories that provide for feeding and cover to escape from predators and protection during extreme weather. Canada lynx utilize late successional forests with large woody debris, such as downed logs and windfalls, to provide denning sites with security and thermal cover for kittens (5-037). Habitat for this species does not exist in the project area.

5.3.3.4 Mollusks

The Utah valvata snail is a federally listed species in Bingham County. Habitat for this species does not exist within the area of consideration.

Utah valvata snail

The Utah valvata snail is part of the native mollusk fauna of the Snake River; they characteristically require cold, fast water or lotic habitats. In the Snake River, the snail inhabits areas between sand and silt/mud grains, in shallow shoreline water, and in pools adjacent to rapids or in perennial flowing waters associated with large spring complexes. The species avoids areas with heavy currents or rapids. The snail prefers well-oxygenated areas of limestone mud or mud-sand substrate among beds of submergent aquatic vegetation. It is absent from pure gravel-boulder substrate. At present, this species occurs in a few springs and mainstem Snake River sites in the Hagerman Valley. Additional locations include a few sites immediately upstream and downstream of Minidoka Dam, near Eagle Rock dam site, and below American Falls Dam downstream to Burley (5-035). Habitat for this species does not exist in the Atomic City site.

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*Indicates a source that was reviewed but not cited.

CONTENTS

FIGURES

TABLES

6. REGIONAL DEMOGRAPHY

This section describes key social and economic characteristics of communities and counties surrounding the Atomic City site. The objective is to provide descriptions of the socioeconomic characteristics of the area surrounding the site in order to support environmental impact analysis should the Atomic City site be selected for further study.

In general this demographics discussion draws on data derived from a "Region of Influence" (ROI). The ROI is defined as that region where "the potential has been identified for adverse environmental impacts" related to GNEP facilities. In the absence of a conceptual design for GNEP facilities and a corresponding analysis of adverse impacts, the ROI for this report is defined as the 32-kilometer (20-mile), and 80-kilometer (50-mile) radius around the Atomic City site. When data is presented on the county level, the ROI was defined as Bannock, Bingham, Bonneville, Butte, Custer, Jefferson, and Power Counties.

The key economic variables presented in this section are population statistics, labor force estimates, social/public services, schools, law enforcement, fire/emergency services, and medical facilities. The section also summarizes local infrastructure, roads, airports, and the availability of public utilities. Additionally, regional housing is discussed in terms of total number of units, occupancy rates, and values.

6.1 Overview and Summary

The Atomic City site consists of 3,310 acres located in Bingham County in southeastern Idaho. The location of the Atomic City site is shown in Figure 6-1. Figure 6-1 and all other maps within Section 6 were prepared using the underlying base maps presented in Section 1, *Maps*, of this report. Additional overlay information presented on the maps in this section is referenced as appropriate.

The findings of Section 6 can be summarized as follows:

- This area is sparsely populated and primarily relies on agriculture, food processing, and services to support its economy. The population density within an 80-kilometer (50-mile) radius of the Atomic City site is approximately 30 persons per square mile, with a population density of less than one person per square mile within 32 kilometers (20 miles) of the Atomic City site. The most populated areas are along the Interstate 15 corridor.

- There are 25 minority census block groups and 28 poverty census block groups within an 80-kilometer (50-mile) radius of the Atomic City site.

- Unemployment in Idaho is below the national average. Employment in Idaho is growing at a rate faster than the national average. Southeastern Idaho has a significant professional, scientific, and technical labor force due to the presence of the INL and the four institutions of higher education.

- Numerous recreational areas, administered by various federal and state agencies and private entities, are located throughout southeast Idaho. Much of the land in this region is owned and/or administered by federal and state agencies.

- Social services, including airports, hospitals, and libraries, are concentrated in the more populated areas.

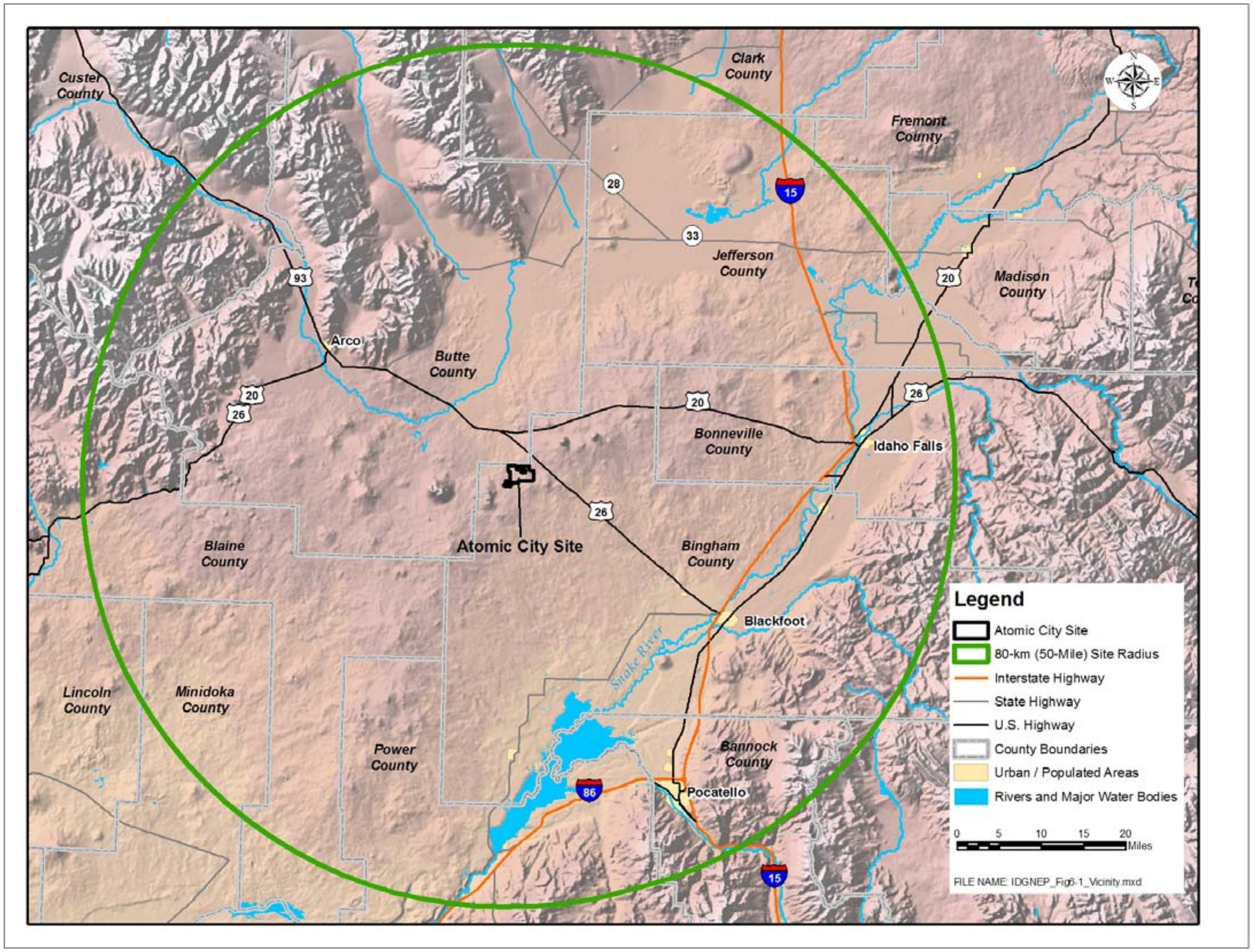

Figure 6-1. Location of the Atomic City site.

6.2 Regional Demography

This subsection addresses population, population trends, and minority and low-income populations within the ROI.

6.2.1 City, Town, and County Population

The site is located adjacent to the town of Atomic City, a small rural town with an area of 0.3 square kilometers (0.1 square miles). According to the U.S. Census Bureau of Statistics, an estimated 26 people lived in Atomic City in 2005, and 27 are estimated to reside in the town in 2007 (6-017).

Bingham County encompasses 2,184 square miles, of which 359 miles lie within the Fort Hall Indian Reservation (6-024). Bingham County ranks 7th in population and 12th in land area compared to the other 44 Idaho counties (6-006). In 2005, an estimated 43,739 people resided in Bingham County, which ranked as the 20th fastest-growing county in the state. The county's growth rate is primarily the result of natural change, or the net change in population as the result of births and deaths in the region. Between 2000 and 2005, Bingham County population grew by 4.8 percent (2,004 persons) due to natural change, compared to a growth rate of 10.4 percent for the State of Idaho as a whole (6-004). The growth in total population for Bingham County from 1970 through 2005 is shown graphically in Figure 6-2.

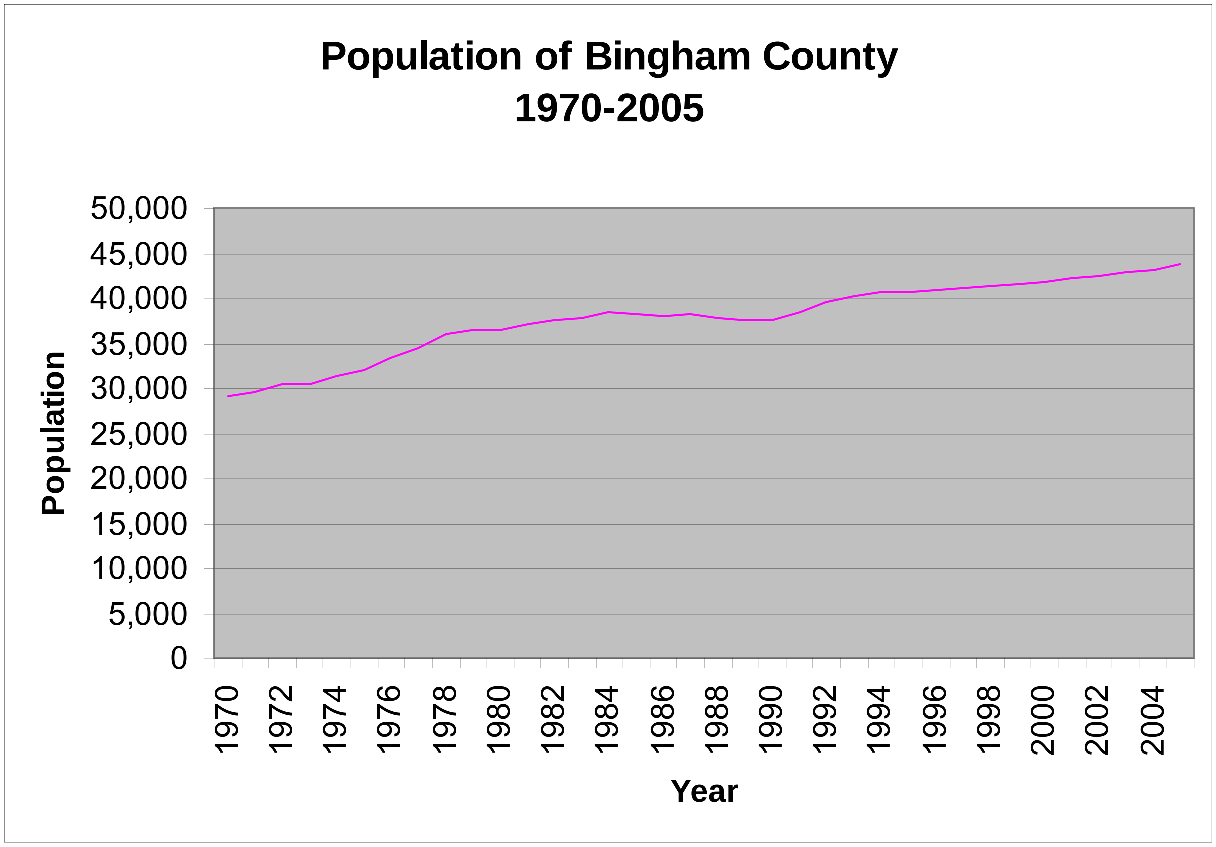

Figure 6-2. Bingham County population growth, 1970-2005 (6-004).

6.2.1.1 Population within an 80-kilometer (50-mile) Radius of Atomic City Site

Bingham County is surrounded by 13 other counties that lie fully or partially within an 80-kilometer (50-mile) radius of the Atomic City site. Figure 6-3 depicts the 50-mile and 32-kilometer (20-mile) radii around the Atomic City site and identifies the counties that lie partially or fully within this circle. Figure 6-3 was developed using data described in Section 1, *Maps*, of this report. The 14 counties lying fully or partially within the 50-mile radius are listed in Table 6-1.

As indicated in Table 6-1, seven of these counties have no cities or towns within the 50-mile radius or only have cities and towns within this radius for which no U.S. Census data are available. These seven counties were excluded from the ROI. The remaining seven counties are identified as the seven counties within the ROI.

Table 6-1. Counties lying fully or partially within a 50-mile radius of the Atomic City site.

Counties of Demographic Interest (Counties containing cities/towns within 50-mile radius for which U.S. Census Data are available)	**Excluded Counties** (Counties with no cities/towns within 50-mile radius or which only contain cities/towns within the radius for which no U.S. Census data are available)
Bannock	Blaine
Bingham	Caribou
Bonneville	Clark
Butte	Fremont
Custer	Lincoln
Jefferson	Madison
Power	Minidoka

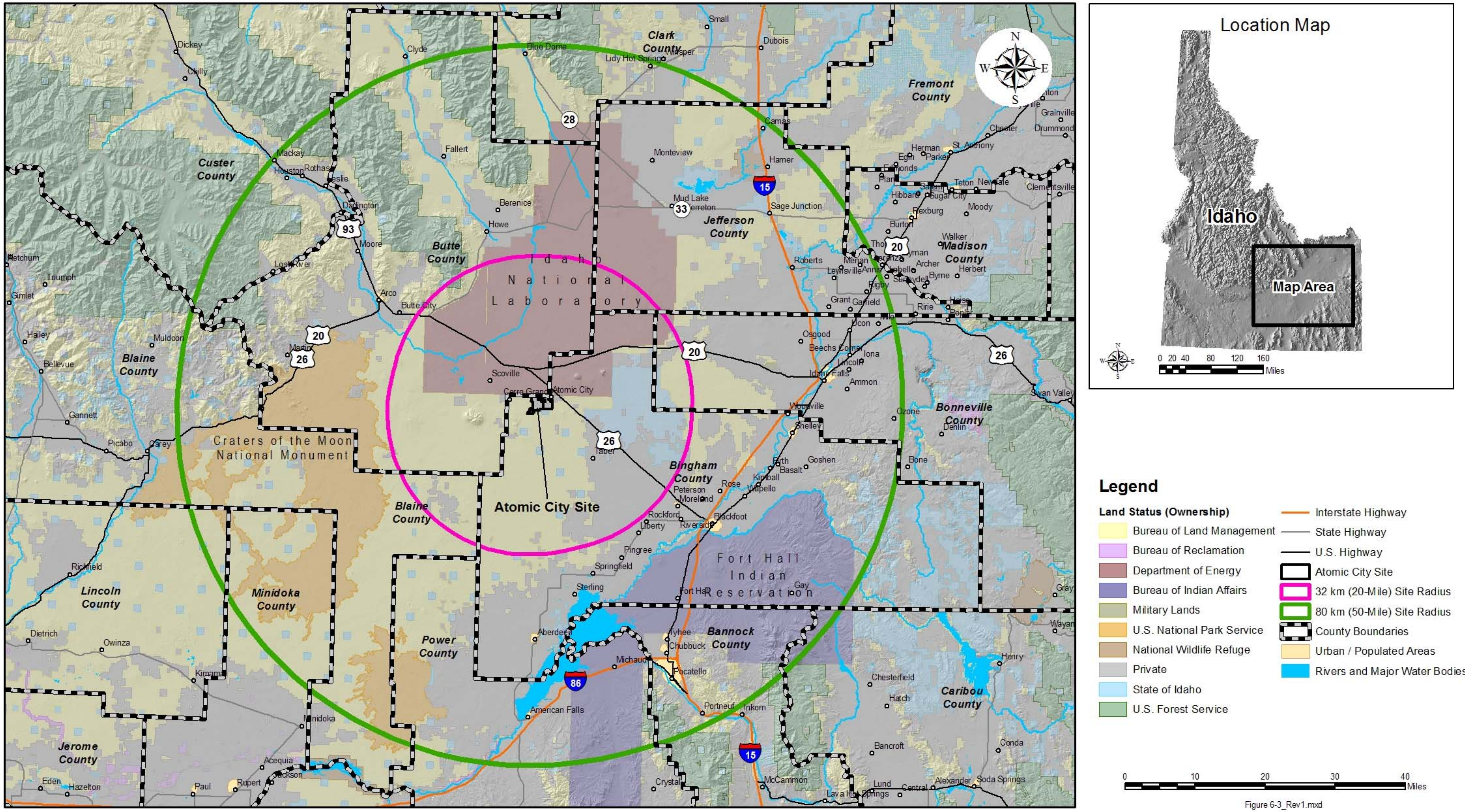

Figure 6-3. Jurisdictions that fall within the 50-mile ROI around the Atomic City site.

According to the 2000 Census, an estimated 212,797 people reside within 50 miles of the Atomic City site. The 50-mile radius encompasses 7,854 square miles, resulting in an estimated population density of 27 persons per square mile (6-042).

Table 6-2 presents the estimated 2000 Census population and the 2005 estimated population for each of the jurisdictions fully or partially within 50 miles of the Atomic City site. The estimated population for cities and towns located within a 50-mile radius of the Atomic City site, and for which census data exists, are also shown.

Table 6-2. Population of jurisdictions fully or partially within the 50-mile ROI of the Atomic City site (6-002, 6-039, 6-040).

County	Cities/Towns	Census 2000 Population	2005 Population Estimate
Bannock		**75,565**	**78, 155**
	Chubbuck	9,700	10,707
	Pocatello	51,466	53,372
Bingham		**41,735**	**43,739**
	Aberdeen	1,840	1,828
	Atomic City	25	26
	Basalt	419	427
	Blackfoot	10,419	10,828
	Firth	408	417
	Fort Hall CDP	3193	N/A
	Shelley	3,813	4,131
Blaine	**—**	**18,991**	**21,166**
Bonneville		**82,522**	**91,856**
	Ammon	6,187	10,925
	Idaho Falls	50,730	52,338
	Iona	1,201	1,256
	Ucon	943	1,015
Butte		**2,899**	**2,808**
	Arco	1,026	989
	Butte City	76	74
	Moore	196	190
Caribou	—	**7,304**	**7,131**
Clark	—	**1,022**	**943**

Table 6-2. (continued).

County	Cities/Towns	Census 2000 Population	2005 Population Estimate
Custer		**4,342**	**4,077**
	Lost River	26	N/A
	Mackay	566	529
Fremont	—	**11,819**	**12,242**
Jefferson		**19,155**	**21,580**
	Hamer	12	12
	Lewisville	467	497
	Menan	707	726
	Mud Lake	270	270
	Rigby	2,998	3,245
	Roberts	647	665
Lincoln	—	**4,044**	**4,545**
Madison	—	**27,467**	**30,975**
Minidoka	—	**20,174**	**19,014**
Power		**7,538**	**7,753**
	American Falls	4,111	4,162
Total Population		**324,577**	**345,984**

N/A: data not available

Table 6-3 provides a summary by county of those towns that are located within the 50-mile ROI around the Atomic City site (as shown in Figure 6-3) for which no U.S. Census data were available.

Table 6-3. Towns within the 50-mile ROI around the Atomic City site for which no U.S. Census data are available (6-002).

County	Town	
Bannock	Portneuf	Tyhee
Bingham	Cerro Grande	Riverside
	Gay	Rockford
	Goshen	Rose
	Kimball	Springfield
	Liberty	Sterling
	Moreland	Taber
	Peterson	Wapello
	Pingree	Woodville
Bonneville	Beechs Corner	Osgood
	Lincoln	Ozone
	Milo	
Butte	Berenice	Martin
	Fallert	Scoville
	Howe	
Clark	Blue Dome	Lidy Hot Springs
Custer	Darlington	Leslie
	Houston	Rothas
Jefferson	Annis	Lorenzo
	Camas	Monteview
	Garfield	Sage Junction
	Grant	Terreton
Power	Michaud	

6.2.1.2 Population Trends

The U.S. Census Bureau provided projections of the rate of population growth for the counties within the ROI through the year 2030 (6-002). All seven counties showed a positive rate of population increase over this time, with the rate of growth increasing through the year 2015. After 2015, the population is still projected to increase, but at a slower rate. The projected rate of growth for the seven counties is shown graphically in Figure 6-4. It should be noted that this graph shows the rate of population increase and is not a graph of total projected population.

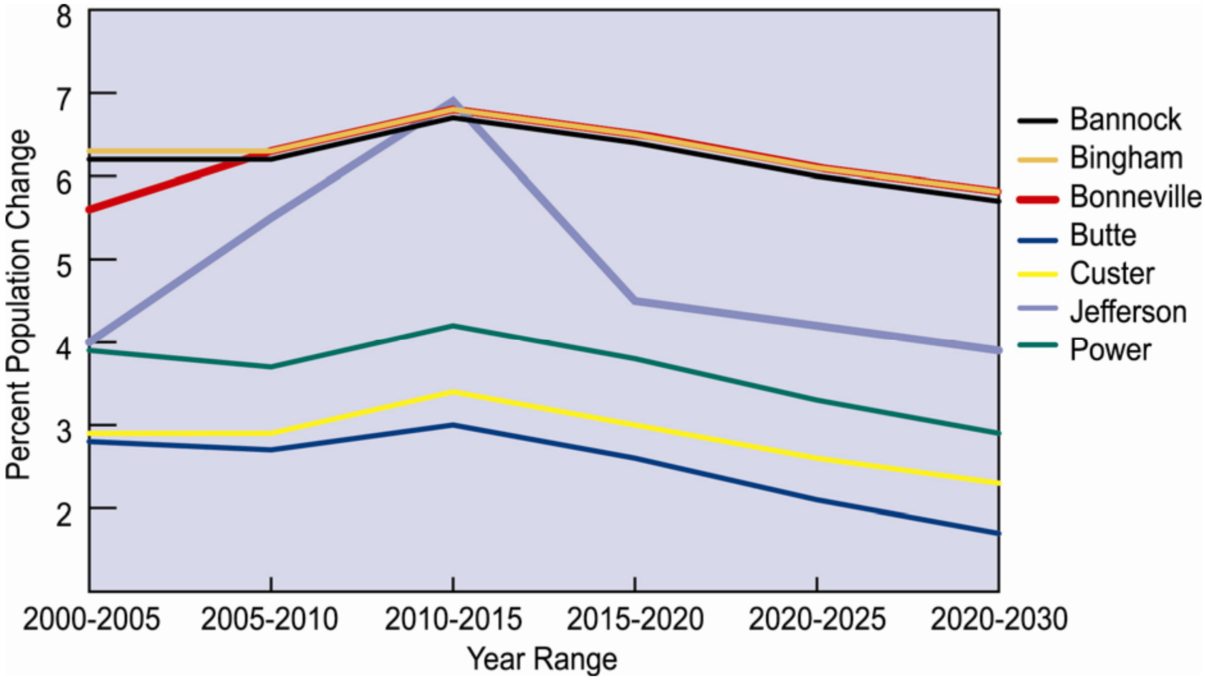

Figure 6-4. Projected rate of population growth for the seven counties within the ROI (2000 through 2030) (6-002).

6.2.2 Minority Persons and Households below Poverty Line

U.S. Census Bureau data were analyzed on the block group level to identify minority and low-income communities within the 50-mile ROI. In 2000, there were a total of 192 census block groups fully or partially within 50 miles of the Atomic City site. Block groups with a population of minority or low-income residents that are 10 percent or more above the state average are considered minority or low-income communities. In 2000, the average minority population in Idaho was 12 percent; therefore, block groups with a minority population of 22 percent or greater were considered minority areas. A total of 25 block groups within the 50-mile radius of the site are classified as minority communities based on 2000 census data. Those areas are depicted in Figure 6-5, which was developed using U.S. Census data (6-042).

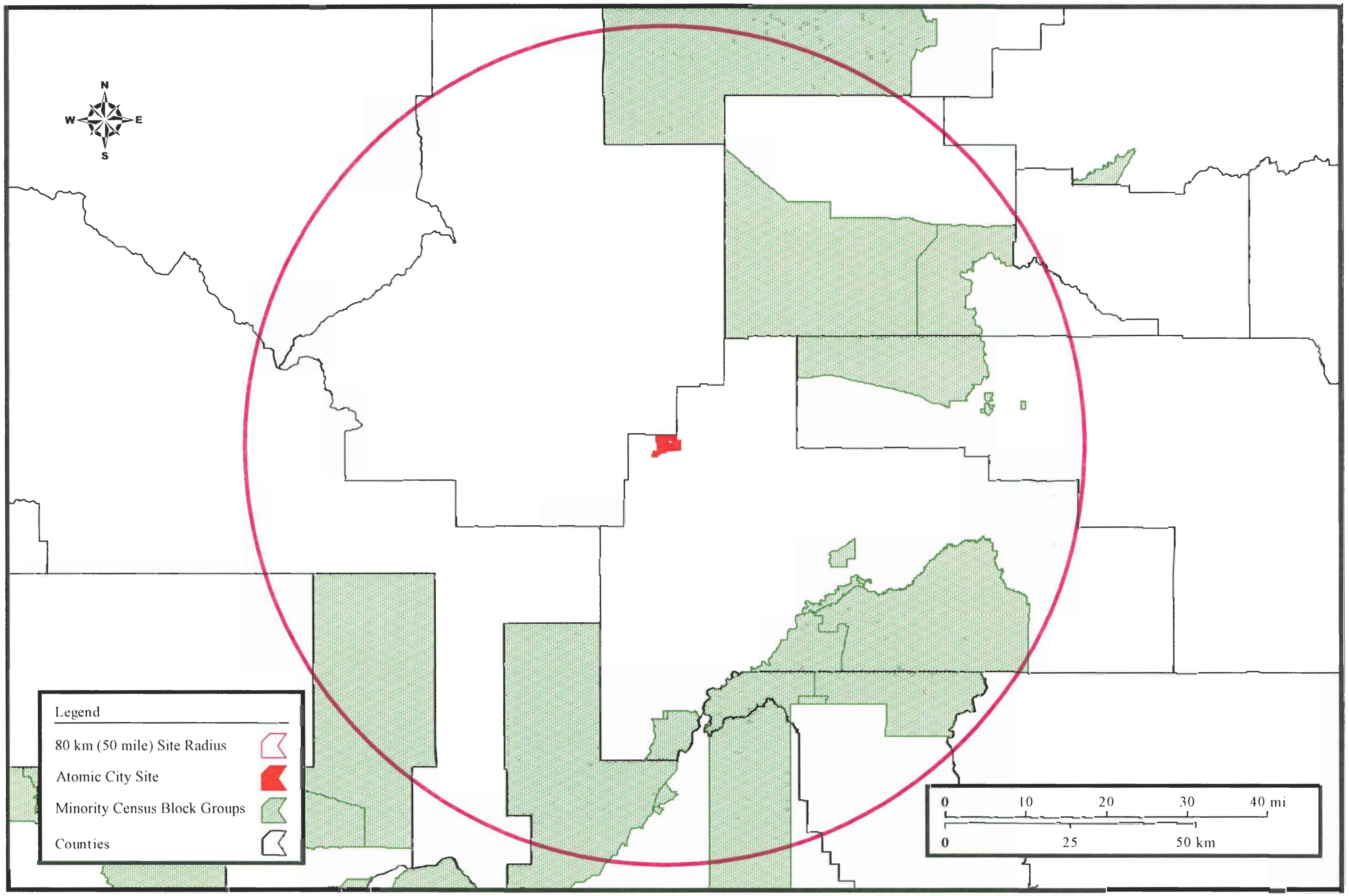

Figure 6-5. Minority census blocks within the 50-mile ROI around the Atomic City site (6-042).

Within a 20-mile radius of the Atomic City site, about 306 of the 758 residents (40 percent) identified themselves as being solely of Black/African American, American Indian and Alaska Native, Asian, Native Hawaiian and other Pacific Islander, some other race, two or more races, or Hispanic or Latino descent in the 2000 Census (6-041). Approximately 40,322 (or almost 19 percent) of residents within the 50-mile radius classified themselves as belonging to a minority group or being one or more other race in the 2000 Census (6-042).

In 2005, non-white Hispanic persons comprised 9.1 percent of Idaho's population and 14.0 percent of Bingham County's population. This group has grown from 2,300 in 1980 to 6,141 in 2005 throughout Bingham County (6-004). The estimated 2005 minority population by county for the seven county ROI is shown in Figure 6-6 (6-002).

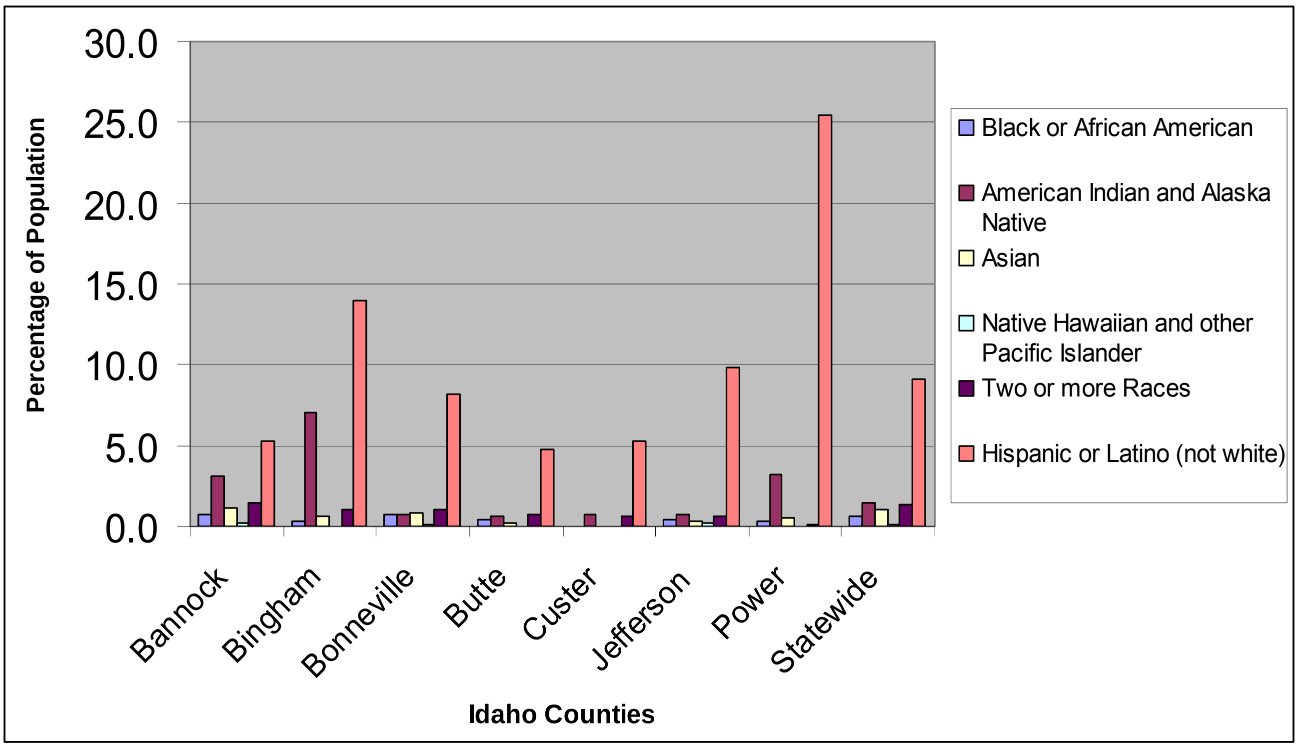

Figure 6-6. Minority population by county in 2005 (6-002).

The U.S. Census Bureau reports there were approximately 28,021 Native American and/or Alaska Natives residing within Idaho in 2000. The Fort Hall Reservation and Off-Reservation Trust Land (ORTL), which lies within Bingham, Bannock, Caribou, and Power Counties, was founded in 1863 and is home primarily to the Shoshoni and Bannock Indian Tribes. In 2000, approximately 3,648 of the 5,762 total reservation residents were Native Americans, compared to 3,035 in 1990, representing an increase of 20.2 percent in the number of Native Americans living on the reservation (6-004).

The low-income population in Idaho based on the 2000 census was 11.8 percent; therefore, block groups with a minority population of 21.8 percent or greater were considered low-income areas. Figure 6-7 shows the location of the 28 poverty census block groups located within the 50-mile ROI around the Atomic City site, which was developed using U.S. Census data (6-042).

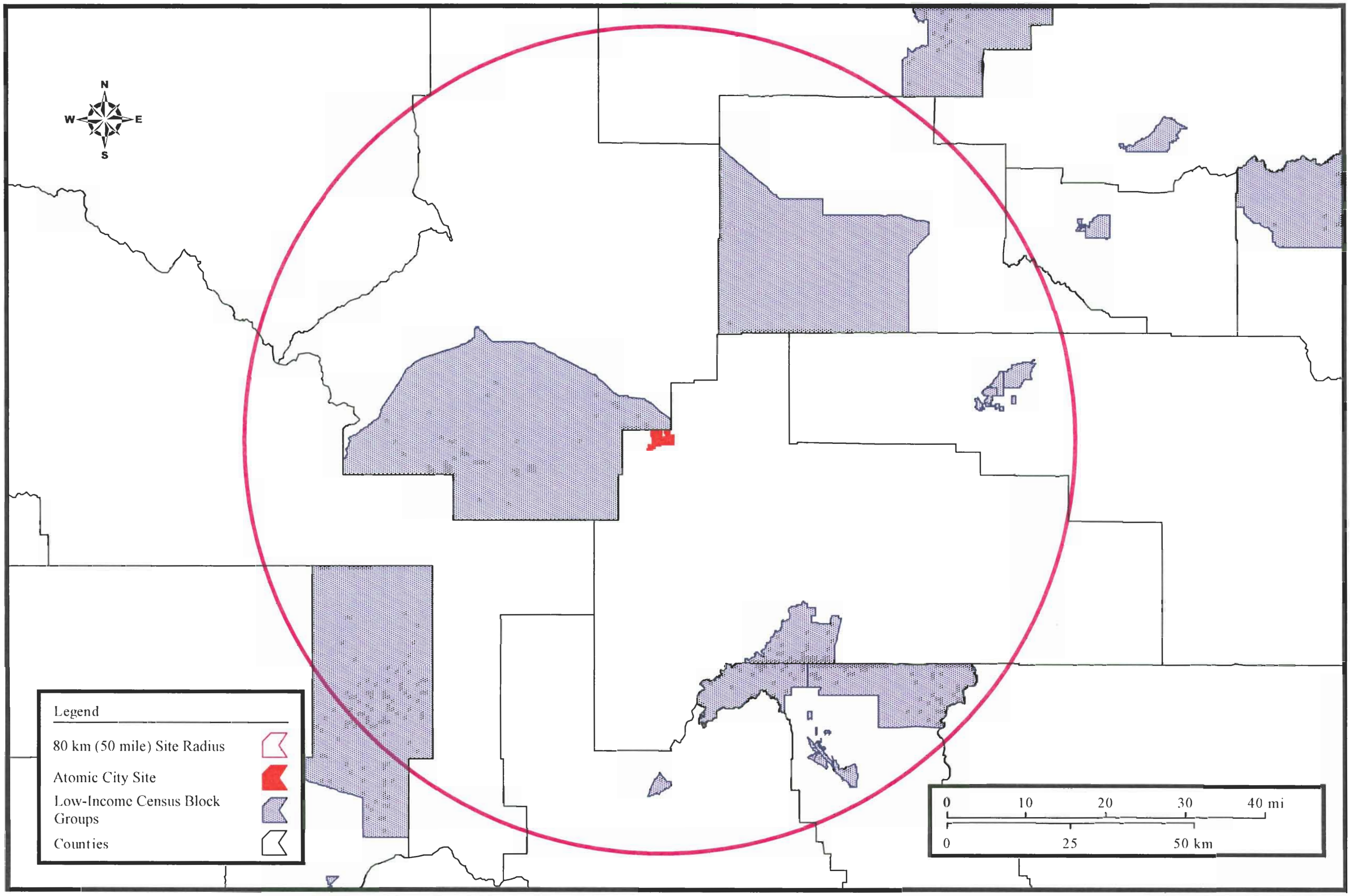

Figure 6-7. Low-income census block groups within the 50-mile ROI around the Atomic City site (6-042).

During 1999, the poverty rate among American Indians on the Fort Hall Reservation and ORTL was 31 percent, compared to 39 percent for American Indians on all U.S. reservations. That year, 1,115 people on the Fort Hall Reservation and ORTL lived in households with an income below the poverty level (6-004).

6.3 Regional Economic Base

This subsection presents information on the regional labor force, employment rates, and economic outlook for the region surrounding the Atomic City site.

6.3.1 Total Regional Labor Force

Table 6-4 lists the industry sectors and number of persons employed in 2000 for the seven county ROI around the Atomic City site.

Table 6-4. Total regional labor force in 2000 (6-029).

Sector	Bannock County	Bingham County	Bonneville County	Butte County	Custer County	Jefferson County	Power County	Total Regional Labor Force
Farming	811	2,405	1,445	365	367	1,389	1,079	7,861
Agriculture Service, Farming, Fishing & Other	—	667	—	—	—	621	—	1,288
Manufacturing	3,054	2,448	2,569	27	—	585	1,717	10,400
Mining	—	—	—	<10	—	<10	<10	unknown
Construction	2,596	1,230	3,960	65	254	825	338	9,268
Transportation, Communication, & Public Utilities	2,078	599	2,067	—	88	272	350	5,454
Wholesale Trade	1,604	1,892	4,330	32	71	444	196	8,569
Retail Trade	8,576	2,751	10,671	234	410	994	393	24,029
Finance, Insurance, & Real Estate	2,884	—	3,209	84	86	320	—	6,583

Table 6-4. (continued).

Sector	Bannock County	Bingham County	Bonneville County	Butte County	Custer County	Jefferson County	Power County	Total Regional Labor Force
Services	11,682	3,613	18,319	5,747	—	1,215	524	41,100
Federal Civilian	534	334	792	47	155	53	27	1,942
Federal Military	314	170	338	16	18	78	36	970
State and Local Government	8,234	2,877	4,518	192	317	1,123	667	17,928

— Data not provided.

As of November 2006, 739,500 people were employed in the State of Idaho. This represents an increase of more than 20,000 persons or 2.8 percent compared to the prior year, and is a record for the number of people employed in the state. The Idaho Department of Commerce and Labor (IDCL) Farm Labor Program states the five counties that lie partially within a 20-mile radius of the Atomic City site (Bingham, Blaine, Butte, Jefferson, and Bonneville) employed an estimated 4,726 people in the agricultural industries, although only a portion of that employment occurred within the 20-mile radius of the Atomic City site (6-035).

Construction employment in Idaho has grown from 20,300 in 1991 to 44,400 in 2005 throughout the state (6-019). In Bingham County, there were approximately 984 persons employed in the construction industry during 2005 (6-035). Construction jobs increased nearly 14 percent during 2005, the highest growth in the state for any job category (6-007). Data on the construction industry and construction labor work force is presented in Table 6-5.

Table 6-5. Regional construction industry and labor force (2004 [6-051]).

	Bannock County	Bingham County	Bonneville County	Butte County	Custer County	Jefferson County	Power County	Total Region
Total Construction Industry Employees	1311	698	2957	20-99	48	423	82	5,539 - 5,618
Total Businesses	241	152	452	5	18	112	19	999
Businesses w/ 1-4 Employees	169	107	293	3	15	76	13	676
Businesses w/ 5-9 Employees	36	25	83	0	2	25	3	174
Businesses w/ 10-19 Employees	22	12	49	1	1	9	2	87
Businesses w/ 20-49 Employees	10	8	20	1	0	2	1	42
Businesses w/ 50-99 Employees	4	0	34	0	0	0	0	38
Businesses w/ 100-249 Employees	0	0	0	0	0	0	0	0
Businesses w/ 250+ Employees	0	0	0	0	0	0	0	0
Total Annual Payroll ($1,000)	38,420	21,569	95,601	N/A	990	10,327	2,323	169,230

N/A – Not Available

The primary industries in Bingham County include agriculture and food processing, although major employment is provided in the service, trade, and government sectors. From 1995 to 2005, Bingham County's labor force increased 5.7 percent and employment increased 7.8 percent (6-035). Major employers in Bingham County include Basic American Foods; Nonpareil Corporation; Idaho Supreme Potatoes, Inc.; State Hospital South; Bingham Memorial Hospital; J.R. Simplot Company; Shoshone-Bannock Indian Tribes; Spudnik Equipment Company; and Wada Farms, Inc. (6-006). Within Atomic City, there was a decrease of 0.22 percent in available employment in 2006; however, an eight percent increase in employment is projected for 2007 (6-017).

Southeastern Idaho has a significant professional, scientific, and technical labor force. Within Bannock, Bingham, and Bonneville Counties, an estimated 5,489 people were employed in this labor category in 2006, representing almost six percent of the working force in these counties. This high level of professional scientific and technical employment is primarily the result of the presence of the INL, state and private universities, and other science and technology companies in the area (6-043).

6.3.2 Unemployment Levels

Idaho's monthly unemployment rate in November 2006 was 3.3 percent, following a record low annual rate of 3.8 percent average unemployment rate for 2005, and nearly a full percentage point below the 2004 unemployment rate. Idaho's unemployment rate was below the national unemployment average of 4.6 percent for 2006. The IDCL analysts expect the average unemployment rate to be approximately 3.4 percent through 2007 (6-035). Table 6-6 presents civilian labor force and unemployment data for the counties within the ROI for the year ending December 2006.

Table 6-6. Civilian unemployment data for the counties within the ROI around the Atomic City site during 2006 (6-029).

County	Civilian Labor Force	Number Unemployed	Unemployment Rate (%)
Bannock	41,514	1,463	3.5
Bingham	21,334	766	3.6
Bonneville	50,842	1,324	2.6
Butte	1,214	52	4.3
Custer	2,767	104	3.8
Jefferson	11,014	320	2.9
Power	3,915	194	5.0
Total	**132,600**	**4,223**	**3.7**

6.3.3 Future Economic Outlook

Actual employment growth in the seven counties within the 50-mile ROI between 2003 and 2006 is presented in Table 6- 7. With the exception of Butte County, there has been an overall increase in growth.

Table 6-7. Employment growth (2003 to 2006) for counties within the 50-mile ROI for the Atomic City site (6-052).

County	2003 (%)	2004 (%)	2005 (%)	2006 (%)	Average (2003 to 2006) (%)
Bannock	3.3	2.1	2.7	1.7	2.5
Bingham	1.8	5.0	2.5	-1.3	2.0
Bonneville	5.5	2.7	6.1	3.4	4.4
Butte	0.0	-0.8	-2.0	-1.8	-1.0
Custer	10.0	3.7	2.8	6.3	5.7
Jefferson	5.4	2.7	6.1	3.4	4.4
Power	2.8	3.6	2.7	1.7	2.7

Of the 18,000 new jobs forecast state-wide from mid-2006 through mid-2007, the increases are predicted to primarily be in the construction, educational, information, administrative, health care, and social service sectors. The increase in production-sector jobs is projected to be approximately 2,000, with most jobs occurring in the construction industry (6-035). According to the IDCL, through 2014 the construction industry is projected to employ over 55,600 people and grow an average of 3.4 percent per year (6-034). Boise, Idaho, is scheduled to host the 2009 Special Olympics World Winter Games, which is expected to bring $24.2 million to Boise and the State of Idaho, and create 606 new temporary jobs. This event may have an effect on the southeastern Idaho economy; however, the majority of the growth will occur outside of the 50-mile ROI for the Atomic City site (6-015).

According to the IDCL financial analysts, Idaho's economy should continue to grow and is expected to grow faster than the national economy. Idaho nonfarm employment should average about two percent growth per year during the 2006-2009 period, raising employment statewide to 661,700 jobs in the terminal year of the forecast. This is faster than the expected U.S. nonfarm job growth of 1.3 percent per year. Idaho personal income, both nominal and real, should also grow faster than the national level. Specifically, Idaho nominal personal income is forecast to increase 6.4 percent annually. National nominal personal income is forecast to rise 6.1 percent per year. It is predicted that Idaho real personal income will grow 4.1 percent annually, and U.S. real personal income will advance 3.8 percent (6-019).

Bingham County's Comprehensive Plan states the number of people below the age of 18 years has declined over the past 10 years and is projected to continue this trend into the near future. Continuing employment opportunities are particularly important to the community because the group of people between the ages of 18 and 64 years, which includes the working population, represents the fastest growing age group in the county. The median age within Bingham County is also rising steadily. U.S. Census projections indicate that the increase in population will ensure that for the next 10 to 15 years the work force in Bingham County will remain about the same in numbers (6-024).

6.4 Housing Information

There were approximately 264 units or about two units per 10 square miles within a 20-mile radius of the Atomic City site in 2000 (6-041). Within 50 miles of the Atomic City site, there were approximately 78,155 housing units with an average density of almost 10 housing units per square mile in 2000 (6-042). The housing demographics for the seven counties in the ROI are detailed below.

6.4.1 Regional Sales and Rental Markets

The southeastern Idaho housing market grew at an average rate of eight percent between 2000 and 2005, as shown in Table 6-8. The highest increase in housing was seen in Jefferson and Bonneville Counties, while Butte experienced a net decrease of one unit over the 5-year period.

Table 6-8. Regional housing sales and rental markets in 2000 and 2005 (6-003).

County	Total Housing Units in 2000	Total Vacant Units in 2000*	Owner Occupied Units in 2000	Renter Occupied Units in 2000	Vacancy Rate Owner (%)	Vacancy Rate Rental (%)	Total Housing Units in 2005	Change in Housing Units 2000-2005 (%)
Bannock	29,102	1,910	19,215	7,977	2.1	8.4	30,635	5.3
Bingham	14,303	986	10,564	2,753	1.7	9.4	15,024	5.0
Bonneville	30,484	1,731	21,467	7,286	1.6	5.9	34,663	13.7
Butte	1,290	201	839	250	4.4	14.7	1,289	-0.1
Custer	2,983	1,213	1,326	444	5.1	32.5	3,042	2.0
Jefferson	6,287	386	5,008	893	1.9	7.0	7,189	14.3
Power	2,844	284	1,909	651	3.4	6.1	2,973	4.5
Total	87,293	6,711	60,328	20,254	N/A	N/A	94,815	8.6

*Includes seasonal and migratory.

6.4.2 Number and Types of Units

According to the U.S. Census Bureau, Atomic City had a total of 22 housing units with an average density of 84.9 homes per square kilometer (216.0 homes per square mile) (6-016). Of the 22 units, 16 units were occupied, and six were unoccupied. Of the unoccupied units, 66.7 percent were available for rent and the remaining 33.3 percent were available for seasonal, recreational, or occasional use in 2000 (6-003). The majority of homes in Atomic City were built after 1956.

According to the 2005 Bingham County Comprehensive Plan, there are presently 18 clusters of urbanization that represent the major population centers within the county. These include the larger centers of Blackfoot, Shelley and Aberdeen, as well as the smaller communities of Atomic City, Basalt, Firth, Fort Hall, Goshen, Grandview, Groveland, Moreland, Pingree, Riverside, Rockford, Springfield, Thomas, Wapello, Jameston, Rose, and Woodville. In addition, there are several rural housing developments. Throughout Bingham County, there were approximately 15,024 housing units in 2005, an increase of 11.4 percent or 1,707 units since 2004. In 2000, the median value of homes in Bingham County was $84,400, and 79.3 percent of residents owned a home (6-024).

The 2000 Census reports that the median value of owner-occupied units in the seven counties within the ROI ranges from a low of $68,700 in Butte County to a high of $93,500 in Bonneville County. The average home value for the seven counties was over $86,800, and the majority of all owner occupied units were valued over $90,000. Of the renter occupied units within the seven counties, the average gross rent was $410 per month, but ranged as high as $485 per month in Bonneville County (6-029).

6.4.3 Trends in Additions

The Bingham County Planning and Zoning Board members would prefer to have growth occur in more concentrated areas; however, growth appears to be occurring in smaller clusters of housing developments. The local government encourages growth in or near the existing population centers. Typical problems presented by high-density development outside existing population centers are the lack of public water and sewer systems and the associated potential health problems (6-024).

Building permits issued for new single-family housing units from 2000 to 2005 for the surrounding counties, as reported by the U.S. Census, are included in Table 6-9. The U.S. Census data did not include estimates for building permits issued in Butte, Custer, or Power Counties.

Table 6-9. Building permits by county for single-family new home construction 2000-2005 (6-033).

	Year					
County	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Bannock	65	59	44	57	64	79
Bingham	78	72	92	107	116	138
Bonneville	178	181	227	308	406	446
Jefferson	97	92	131	235	240	329

6.5 Educational Systems in the Region

According to the Idaho State Department of Education, 16 school districts lie fully or partially within 50 miles of the Atomic City site (6-026). These school districts are listed by county in Table 6-10.

Table 6-10. School districts lying partially or fully within 50 miles of Atomic City site (6-026, 6-044).

County	District Number	District Name
Bannock	025	Pocatello
Bingham	052	Snake River
	055	Blackfoot
	058	Aberdeen
	059	Firth
	060	Shelley
Blaine	061	Blaine County
Bonneville	091	Idaho Falls
	093	Bonneville
Butte	111	Butte
Jefferson	251	Jefferson County
	252	Ririe
	253	West Jefferson
Power	381	American Falls
Custer	182	Mackay
Minidoka	331	Minidoka

During the 2006-2007 school year the school districts listed in Table 6-10 included 137 public schools: 75 primary schools, 27 middle schools, 34 high schools, and one school that spans kindergarten through grade 12 (6-026). In addition, there are 11 reported private schools within the 50-mile ROI. Figure 6-8 shows the delineations of the school districts within the 50-mile ROI. This figure is based on the maps developed for Section 1, *Maps*, of this report.

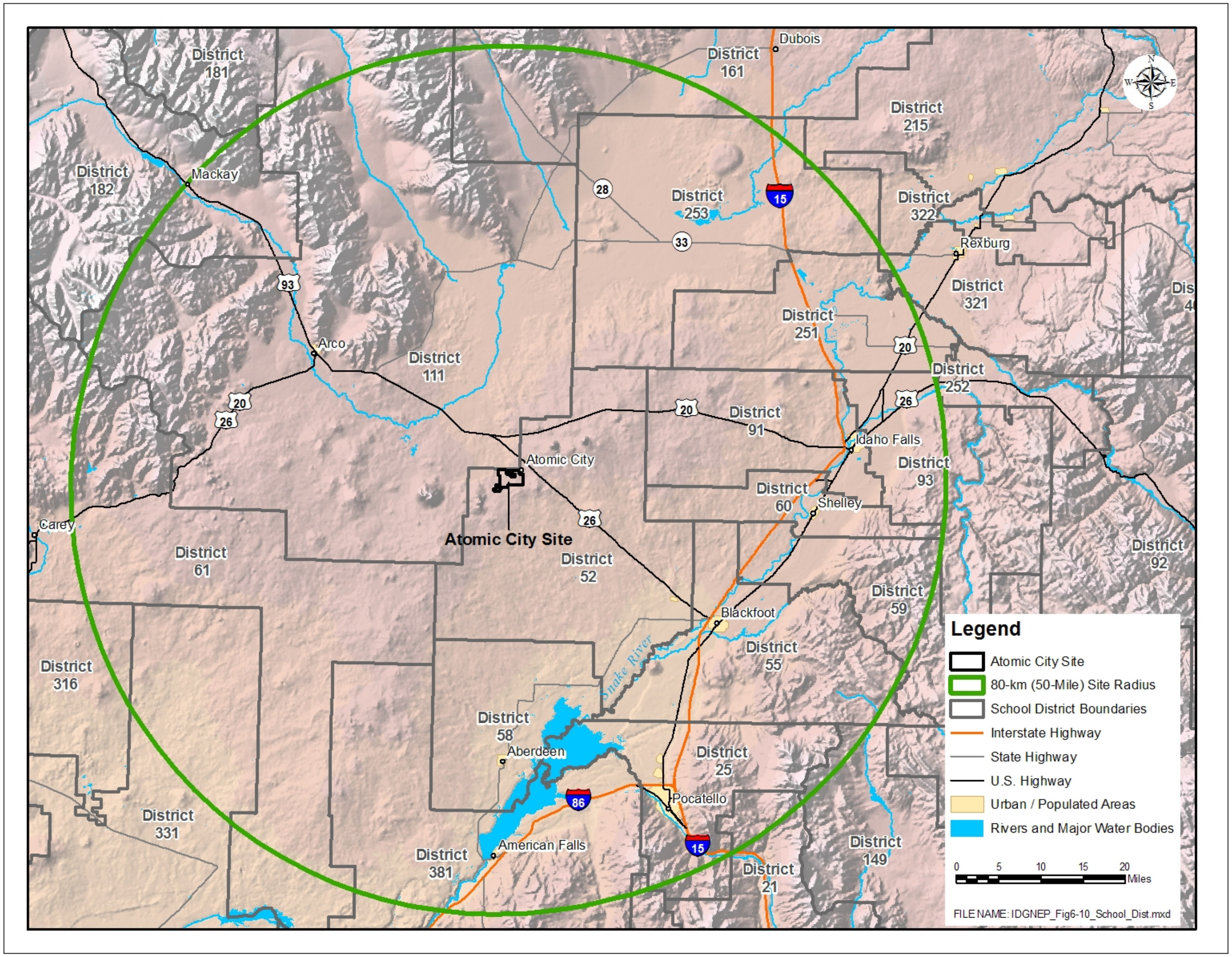

Figure 6-8. School districts within the 50-mile ROI around the Atomic City site (6-026, 6-044).

6.5.1 Present Capacity

Table 6-11 presents the current (2006-2007) and past (1999-2000) breakdown of the estimated 58,142 students enrolled in the school districts listed in Table 6-10 that lie fully or partially within 50 miles of the Atomic City site.

Table 6-11. Public school student enrollment 1999/2000 and 2006/2007 for school districts lying partially or fully within 50 miles of the Atomic City site (6-026).

	Public Schools Enrolled Students	
	1999-2000	2006-2007
Pre-Kindergarten	557	696
Kindergarten	3,881	4,598
Elementary (grades 1-6)	29,569	30,622
Secondary (grades 7-12)	27,322	25,670
Total	**56,891**	**56,292**
	Private Schools Enrolled Students	
	1999-2000	2006-2007
Pre-Kindergarten	157	273
Kindergarten	203	180
Elementary (grades 1-6)	1191	1105
Secondary (grades 7-12)	409	292
Total	**1,960**	**1,850**

During the 2004-2005 school year, 1,888 of the 56,292 public school students (three percent) were classified as migrant students (children of migrant families) for the school districts listed in Table 6-10 (6-044).

Dropout rates in school districts within 50 miles of the Atomic City site during the 2004-2005 school year are presented in Table 6-12.

Table 6-12. Dropout rates for Grades 9-12 in ROI educational districts 2004-2005 (6-004).

County	District Number	District Name	Dropouts	Enrollment Grades 9 to 12	Dropout Rate (%)
Bannock	025	Pocatello	172	5,561	4.57
Bingham	052	Snake River	5	1,043	0.68
	055	Blackfoot	48	1,928	3.69
	058	Aberdeen	5	405	1.88
	059	Firth	0	428	0.05
	060	Shelley	4	933	0.64
Blaine	061	Blaine County	27	1,431	2.88
Bonneville	091	Idaho Falls	128	4,938	3.85
	093	Bonneville	19	3,720	0.76
Butte	111	Butte	1	245	0.60
Jefferson	251	Jefferson County	12	1,854	0.98
	252	Ririe	0	333	0.0
	253	West Jefferson	2	320	0.92
Power	381	American Falls	6	786	1.14
Custer	182	Mackay	0	110	0.0
Minidoka	331	Minidoka	43	1,969	3.44

Five schools offering post-secondary education are located within the 50-mile ROI. Among these are Eastern Idaho Technical College (EITC) in Idaho Falls, Idaho State University (ISU) in Pocatello, and the School of Hairstyling in Chubbuck. These three schools had a combined enrollment of 14,830 according to fall 2005 enrollment data (6-044). The School of Hairstyling is a private 2-year school, EITC is a public 2-year college, and ISU is a public university offering 4-year and graduate study programs. ISU also offers on-campus living quarters for students.

The Center for Higher Education is located in Idaho Falls and is a state-of-the-art facility built in 1994. The ISU, along with the University of Idaho, offers courses and student services at this facility (6-025). This campus is for commuting students only, and does not provide student housing. The Idaho branch of Brigham Young University (BYU)-Idaho, in Rexburg (approximately 58 miles from Atomic City), offers a variety of associate and bachelor's degree programs. Approximately 11,757 (Full-Time-Equivalent) students are enrolled at this private post-secondary institution affiliated with The Church of Jesus Christ of Latter-day Saints. BYU-Idaho provides on-campus student housing (6-028).

6.5.2 Projected Capacity

The school enrollment for the school districts listed in Table 6-9 has decreased at a rate of approximately 1.06 percent from the 1999-2000 school year to the 2006-2007 school year compared with a 4.8 percent increase statewide in Idaho during the same time period. According to the Projections of Education Statistics to 2015, statewide pre-kindergarten to grade 12 enrollments are expected to increase 21.2 percent by the year 2015 (6-044).

6.5.3 Percentage of Utilization

In 2004-2005, the pupil teacher ratio averaged 18.4 to 1 for all schools within the 50-mile ROI. In 2003-2004, the national pupil-teacher ratio was about 16 to 1 within the 50-mile ROI, with the statewide average of all schools having a pupil-teacher ratio of 18.11 to 1.

According to the U.S. Department of Education, average enrollment was 378 students per school in primary schools, 419 in middle schools, and 477 in high schools for the school districts lying fully or partially within 50 miles of the Atomic City site. During the 2003-2004 school year, the nationwide average number of students per school was 438 in primary schools, 616 in middle schools, and 758 in high schools (6-044).

6.6 Recreational Facilities and Opportunities

Numerous recreational areas administered by various federal and state agencies and private entities are located throughout southeast Idaho. A variety of recreational activities are offered including camping, hiking, fishing, hunting, snowmobiling, water sports, wildlife photography, hot springs, scenic views, and gambling. Recreational areas located within 50 miles of the Atomic City site include national and state parks and monuments, county facilities, historic preservation areas, community parks, campgrounds and NWRs. These areas are shown in Figure 6-9, which uses the underlying base maps developed for Section 1, *Maps*, of this report.

Recreational areas in southeastern Idaho include Hell's Half Acre National Landmark, Sawtooth Wilderness, Fish Creek Reservoir, Salmon Challis National Forest, Oregon National Historic Trail, Massacre Rock State Park, Sterling WMA, Camas NWR, Springfield Lake, McTucker Ponds, and the American Falls Dam and Reservoir.

The National Park Service administers Craters of the Moon National Monument. National Park Service projections indicate an increase of 1.8 percent in 2007 visitations from visitations during 2006 (6-053).

The American Falls Reservoir is the second largest reservoir in Idaho. Recreation activities include sailing, water skiing, windsurfing, swimming, boating, and fishing. Idaho Power has stocked the reservoir since 1981. Eight thousand pounds of rainbow trout are released annually into the reservoir to improve the trout fishery. The American Falls Reservoir area is an excellent bird viewing location. Geese and ducks abound, especially during their annual migration, and it is a popular wintering area for bald eagles and white pelicans (6-047).

McTucker Ponds are part of the Idaho IDFG Family Fishing Waters. These sites are set up to encourage family fishing. The season is year-round with a limit of six trout and six bass and no bag limit on other species (6-048).

The Snake River, located about 25 miles southeast of the Atomic City site, is the closest significant perennial water body to the Atomic City site. The Snake River is 1,038 miles in length and is used for a variety of outdoor activities, including fishing and boating (6-049).

Within the 50-mile radius of the Atomic City site are several more water bodies. These include Camas Creek, 37 miles northeast of the Atomic City site; Mud Lake, 36 miles northeast; and Camas NWR, 42 miles to the north. Mud Lake is a Wildlife Management Area of the IDFG. Mud Lake and Camas NWR provide a stopover area for migratory waterfowl and has some wintering bald eagles. Market Lake, 40 miles northeast of the site, is an IDFG management area for waterfowl. The last flowing water in this area is Medicine Lodge Creek which ends just within the 50-mile radius of the Atomic City site north of Mud Lake as the waters infiltrate into the aquifer.

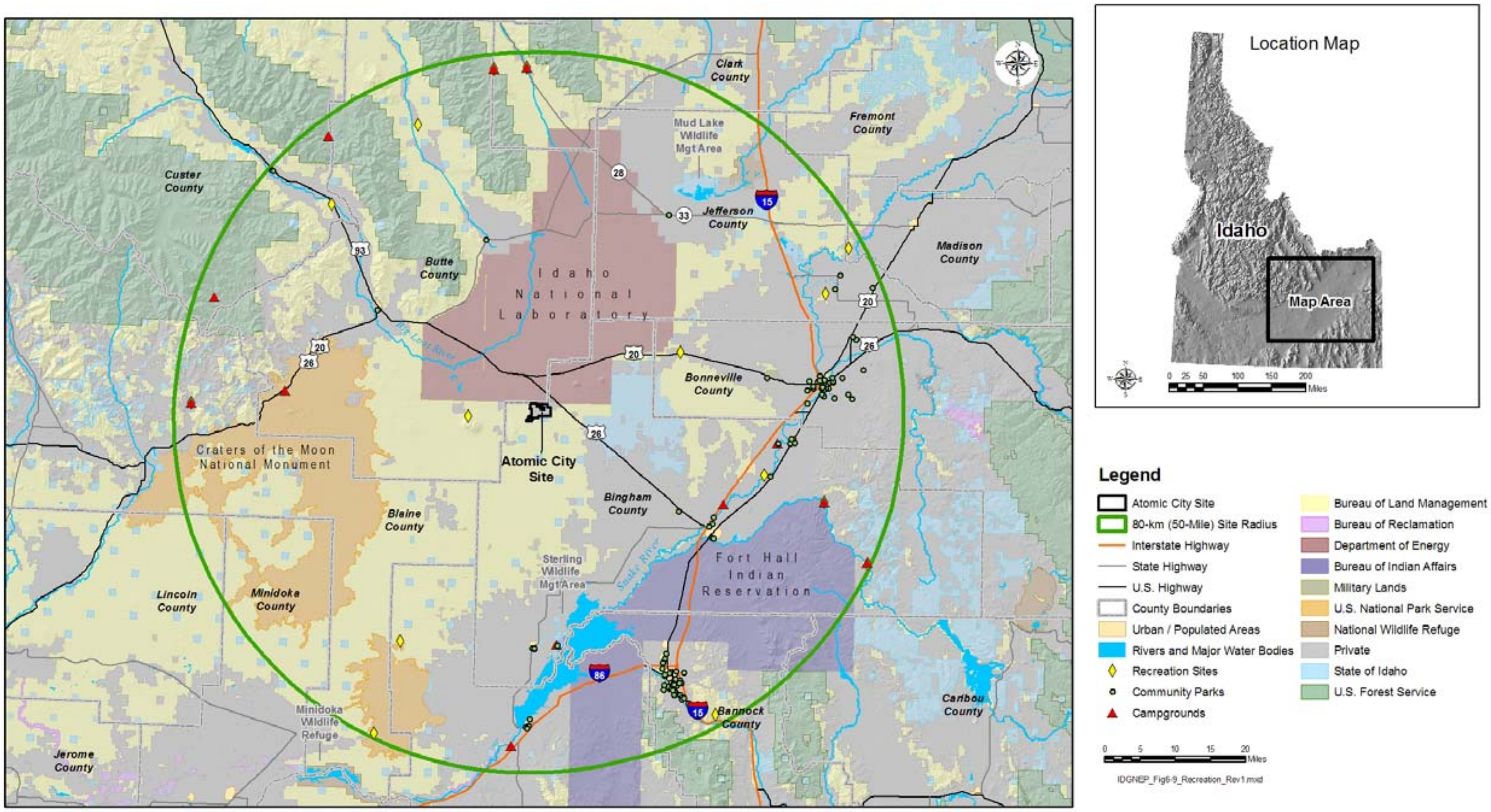

Figure 6-9. Recreational facilities and opportunities within the 50-mile ROI around the Atomic City site (6-060, 6-061, 6-062).

Performing arts, amusement, gambling and other recreational opportunities primarily exist in Idaho Falls, Blackfoot, and Pocatello. Table 6-13 summarizes the 1997 and 2002 Economic Census Survey of Arts, Entertainment and Recreation throughout the fourteen counties within the 50 miles radius in Southeastern Idaho (6-037, 6-038).

Table 6-13. Arts, entertainment, and recreation opportunities in Southeastern Idaho (6-038, 6-037).

Type of Facility	Number of facilities (1997)	Number of facilities (2002)
Performing Arts and Spectator Sports and related	113	159
Amusement and Gambling	79	104
Other Recreation (golfing, skiing, fitness, bowling)	22	28

6.7 Taxes

This section provides tax information including the state and regional tax structure, and distribution of current revenues. The Idaho State Tax Commission implements the taxation policies and incentives necessary to fund state programs. Several types of state and local taxes are imposed within the ROI. Applicable tax types include: personal income, corporate income, property, and sales and use taxes.

6.7.1 State Tax Structure

Most of Idaho's tax revenue comes from three sources: property tax, income tax (personal and corporate), and sales and use tax. The Idaho State Tax Commission collects income tax and sales and use tax. Property taxes fund local government and are imposed and collected by the county where the property is located.

Property Tax

The average urban rates of 1.57 percent and rural rate of 1.13 percent is calculated on average statewide total tax rates for 2005. It can be calculated by multiplying the average tax rate by the property value, less exemptions. The actual tax rate is the sum of the tax rates of all the taxing districts in one location. Owner-occupied primary residences in Idaho qualify for a homeowner's exemption; this exempts 50 percent of the taxable value of the home and up to one acre of land, up to a maximum of $75,000 for 2006 property taxes and $89,325 for 2007 property taxes. Farms qualify for a partial exemption. An Idaho Property Tax Reduction (formerly Circuit Breaker) of up to $1,320 is available to persons age 65 and older, widowed or disabled persons of any age, and former Prisoners of War who meet income and residence requirements. Personal property used in a business, such as a desk or a computer, is considered taxable property. The business owner is required to report all taxable personal property to the county assessor annually and to pay a tax based upon the assessed value of the property to the county treasurer's office.

Income Tax

Personal income tax is graduated from 1.6 percent to 7.8 percent so higher earnings are taxed at a higher rate. For 2006, the first $1,198 of taxable income is taxed at 1.6 percent, the next $1,198 is taxed at 3.6 percent, etc. The maximum 7.8 percent tax rate is reached at $23,963 of taxable income for single filers and $47,926 for married couples filing jointly. Idaho residents are taxed on their total income, even if it's earned in another state or country. Idaho income tax brackets are adjusted for inflation each year. Taxpayers don't have to make estimated payments for their personal income tax return. Most wage earners have income tax withheld by their employers. Credits to offset income tax due include: $20 grocery credit ($35 for people age 65 or over), credit for tax paid to other states, and credits for donations to Idaho educational entities and some nonprofit youth and rehabilitation facilities. Idaho does not tax Social Security income and Tier 1 and Tier 2 Railroad Retirement benefits. Retired taxpayers may receive a partial tax exemption for civil service and military retirement income received after age 65 (62 if disabled). A $20 grocery credit is refundable to residents over 62 who are not required to file an income tax return ($35 for people over 65).

Idaho's corporate income tax rate is 7.6 percent of the taxable income of a corporation transacting business or authorized to transact business in Idaho or with income attributable to Idaho. Multi-state corporations must apportion their Idaho income using a weighted three-factor formula consisting of property, sales, and payroll factors, with the sales factor double-weighted. A corporation may elect to determine its income using a water's edge election. This election allows exclusion of a substantial portion of foreign subsidiaries' income.

Sales and Use Tax

Idaho has a 6 percent sales tax on retail sales, leases, or rentals of tangible personal property. The tax also applies to fees for admissions, recreation, hotel/motel/campground accommodations, intrastate charter flights, and some types of labor. A 6 percent use tax is due on the use, consumption, or storage of tangible personal property in Idaho on which sales tax was not paid. This includes items purchased by mail order or Internet.

An additional 2 percent travel and convention tax applies to stays at hotels, motels, and campgrounds. Revenue from the tax is used to promote tourism. The cities of Chubbuck and Pocatello (within the 50-mile ROI) apply an additional lodging tax on the rental of hotel and motel rooms. The following excise tax list identifies some of the taxes that apply to businesses.

- Beer and wine tax – paid by distributors
- Insurance tax – paid to the Department of Insurance by insurers
- Cigarette and tobacco tax – paid by wholesalers or importers
- Coin operated amusement device annual decals – paid by owners or operators
- International Fuel Tax Agreement Licenses – paid by interstate truckers
- Mine license tax – paid by miners or royalty recipient
- Motor fuels tax – paid by distributors
- Electricity tax – paid by hydroelectric power producers (6-057).

6.7.2 Local Tax Structure

Counties within the ROI impose property and travel and convention room taxes. Table 6-12 presents tax receipts for counties within the ROI. Table 6-13 (6-050) presents 2006 property tax rates for counties in the ROI.

Table 6-12. County travel and tax revenues (6-056).

County	FY02 Travel and Convention Room Receipts ($)	FY02 Property Taxes (Budgeted $)
Bannock	285,448	48,717,179
Bingham	23,121	18,821,647
Bonneville	329,640	57,658,050
Butte	5,824	1,944,658
Jefferson	10,474	7,832,512
Custer	64,781	3,000,713
Power	2,838	10,534,246

Table 6-13. 2006 Average property tax rates in region of influence (6-050).

County	Average Urban (%)	Average Rural (%)
Bannock	2.079	1.126
Bingham	1.955	1.178
Bonneville	1.696	1.060
Butte	1.940	1.329
Custer	0.540	0.249
Jefferson	1.588	0.909
Power	2.386	1.444

6.7.3 Distribution of Present Revenues

Taxes are distributed to the Idaho general fund with dollars supporting the following programs: public schools, health and human services, public safety programs, institutions of higher education, local governments, and state and local road funds. In 2005, Idaho as a whole ranked 30th in taxes collected per capita (6-055). Figure 6-10 shows the percentage of distribution for the 2005 General Fund. Revenue sources for Idaho are summarized in Table 6-14. A summary of the Idaho tax growth rate from 1997 to 2001 is shown in Table 6-15.

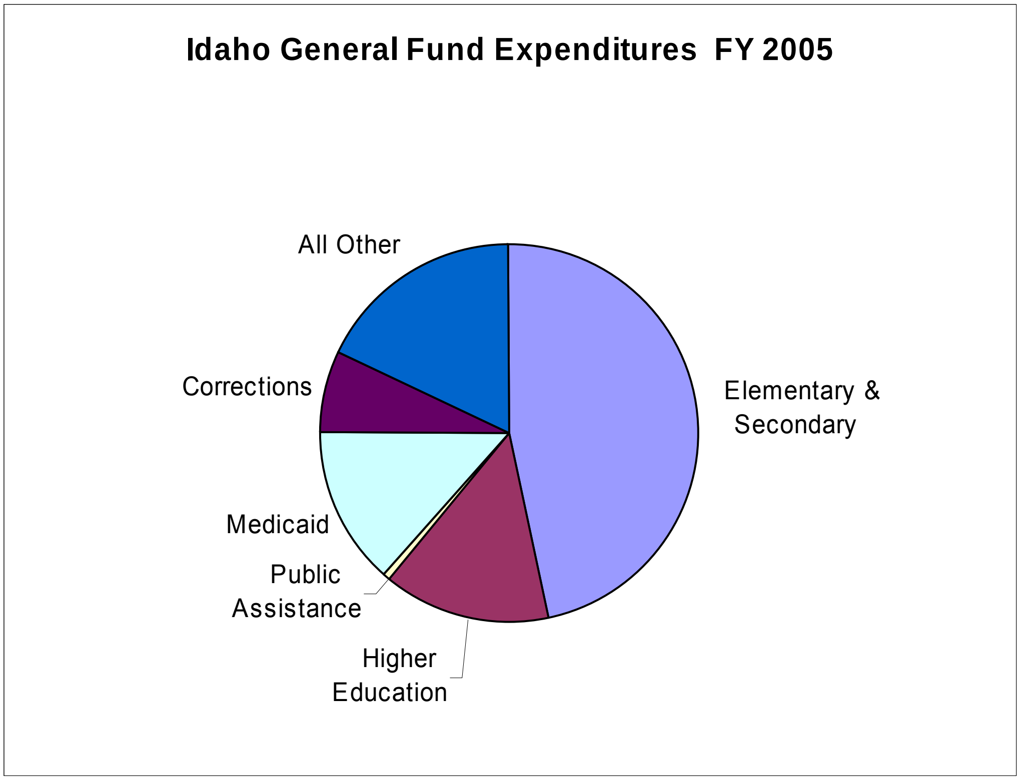

Figure 6-10. Idaho General Fund expenditures (6-058).

Table 6-14. Revenue sources in the general fund Fiscal Year 2004 to Fiscal Year 2006 ($ in millions) (6-054).

State of Idaho	Sales Tax	Personal Income Tax	Corporate Income Tax	Gaming	Other Taxes and Fees	Total
Fiscal Year 2003	700	838	93	0	120	1,751
Fiscal Year 2004	886	902	103	0	193	2,084
Fiscal Year 2005	951	1,036	140	0	142	2,269

Table 6-15. Idaho tax growth rate percentage change summary (1997 to 2001) (6-059).

Annual growth rate	1997 (% change)	1998 (% change)	1999 (% change)	2000 (% change)	2001 (% change)
Personal income tax	8.3	19.3	8.5	14.1	6.6
Sales Tax	3.0	4.2	18.5	6.6	3.2
Corporate income tax	(19.5)	(22.8)	(18.6)	30.8	13.3
Product Taxes	1.0	1.8	(0.6)	1.3	29.8
Misc. Revenue	3.8	9.3	8.6	12.0	63.5
Total General Fund	3.0	6.5	9.6	12.1	9.0

6.8 Local Planning Requirements

This section presents the local planning and land use requirements that would apply for location of industrial facilities at the Atomic City site in support of GNEP.

6.8.1 Population Growth

According to the U.S. Department of Commerce, Idaho's population is expected to increase by 575,000 persons through 2025, making it the sixth fastest growing state in the country. Bingham County has grown by 2,004 residents or 4.8 percent between 2000 and 2005. Idaho's overall population has grown 10.4 percent over the same period. Bingham County has experienced significant growth in its rural areas outside of the larger towns within the county, with the most growth occurring around Blackfoot, Shelley, and Firth (6-024).

6.8.2 Housing

In preparation for the anticipated growth in the community, Bingham County Planning and Zoning Commission has prepared a plan to address the needs of the area. They expect a continuation of the 12.9 percent increase in housing units that was experienced from 1990 to 2000. Area planners are encouraging the development of larger lots and self-sustaining subdivisions, or smaller lots with open spaces to support the "rural character" of Bingham County. The County also encourages the development of higher density housing near the population centers or where public facilities and social services are available (6-024).

6.8.3 Changes in Land Use

Bingham County has instituted policies that mandate growth patterns to preserve prime agricultural and natural resource lands as well as to allow for residential and commercial growth. The local government also encourages industrial uses where water supply, waste disposal, power, fire protection, and other required services and facilities can be most economically provided. The Bingham County Comprehensive Plan also states that prior to considering changes in land use away from agricultural usage an analysis, deliberation and resolution of land use proposals would be required. As the local economy relies heavily upon agriculture, the new land use would need to consider the impact to the local government's revenue base (6-024).

6.9 Social Services and Public Facilities

There are a number of social services and public facilities to serve the communities in and around the Atomic City site. Within a 50-mile radius, there are ten medical facilities with capabilities to address a wide range of health needs. The emergency response agencies in this area include approximately 22 fire and rescue departments to respond to the immediate needs of the community. There are also 16 airports within the counties surrounding the Atomic City site to transport passengers and freight (6-018). Figure 6-11 shows the locations of the larger public airports within 50 miles of the Atomic city site. This figure was developed using the base maps from Section 1, *Maps*, of this report.

6.9.1 Present Social Services

There are numerous agencies devoted to providing the community with health and human resource services. Within the 50-mile ROI there are home care providers, hospitals, medical laboratories, mental health services, substance abuse treatment facilities, foster care organizations, and agencies offering counseling and educational outreach services.

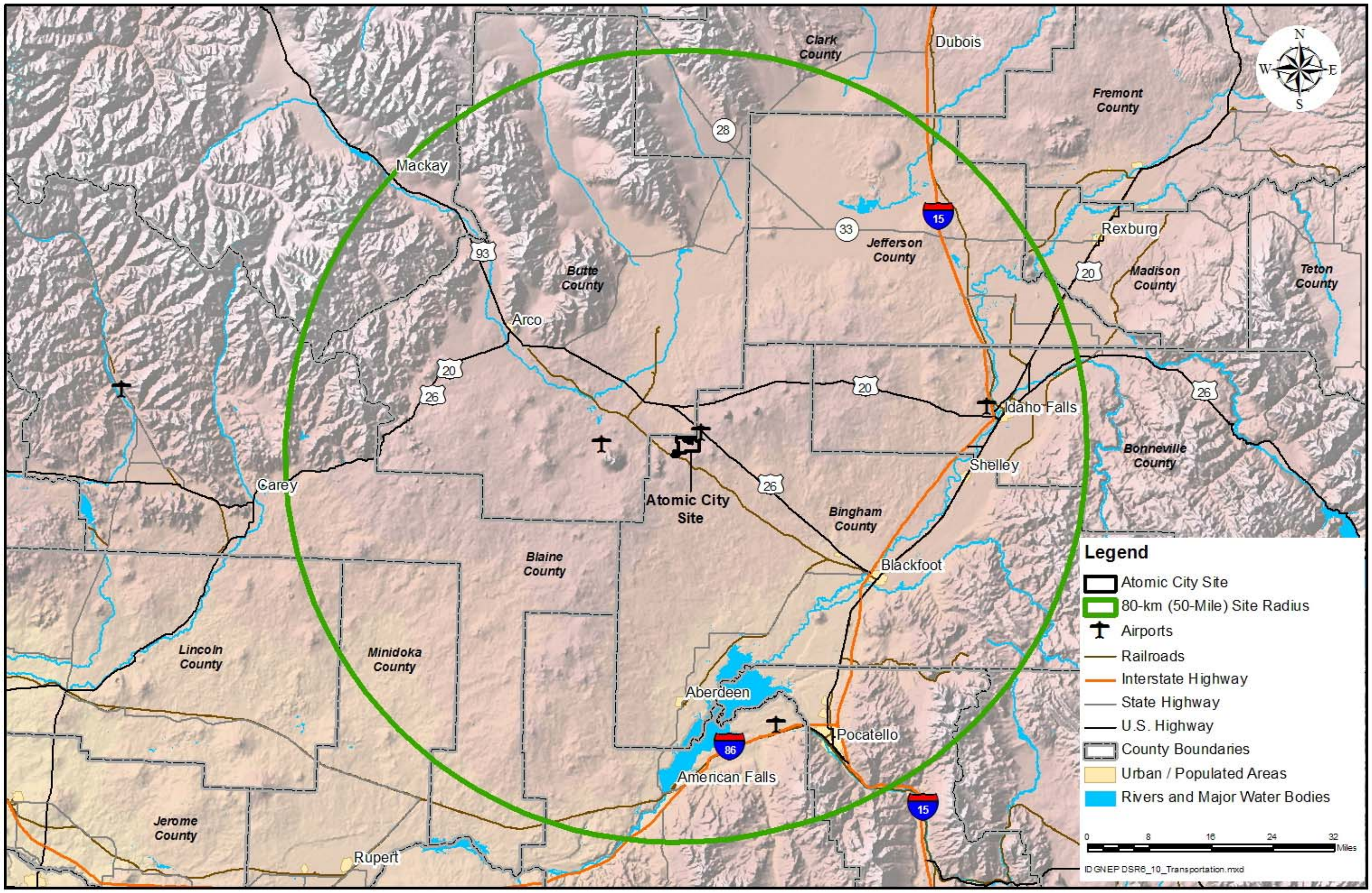

Figure 6-11. Public airports within the 50-mile ROI around the Atomic City site (6-018).

6.9.1.1 Health Facilities

Health services including medical centers, counseling services, child care resources, crises care, and emergency services are available within each of the counties within the 50-mile ROI. The major health facilities providing in patient care services and their locations are listed in Table 6-16 (6-023).

Table 6-16. Health care facilities within the 50-mile ROI around the Atomic City site (6-023).

Name	Number of Patient Beds	City
Harms Memorial Hospital	41	American Falls
Lost Rivers Hospital	35	Arco
Bingham Memorial Hospital	98	Blackfoot
Mountain River Birthing and Surgery Center	8	Blackfoot
State Hospital South	135	Blackfoot
Eastern Idaho Regional Medical Center	299	Idaho Falls
Idaho Falls Recovery Center	7	Idaho Falls
Mountain View Hospital	20	Idaho Falls
Portneuf Medical Center	253	Pocatello
Portneuf Medical Center Behavioral Health	94	Pocatello

6.9.1.2 Emergency Management

Each county within the 50-mile ROI is served by municipal or volunteer emergency management services. The emergency response agencies listed in Table 6-17 are located within the ROI (6-027).

Table 6-17. Emergency management services within the 50-mile ROI of the Atomic City site (6-027).

Fire Department Name	Mail City	County	Dept Type	Number of Stations	Active Firefighters (Career)	Active Firefighters (Volunteer)	Active Firefighters (Paid per Call)	Non-Firefighting (Civilian)	Non-Firefighting (Volunteer)
Aberdeen Fire Department	Aberdeen	Bingham	Volunteer	2	0	0	31	0	4
American Falls Fire Department	American Falls	Power	Volunteer	1	0	0	19	0	0
Ammon Fire Department	Ammon	Bonneville	Volunteer	1	0	25	25	0	0
Arimo Fire Department	Arimo	Bannock	Volunteer	1	0	0	13	0	0
Blackfoot Fire Department	Blackfoot	Bingham	Mostly Volunteer	2	23	3	20	1	0
Central Fire District	Rigby	Jefferson	Mostly Volunteer	4	1	0	50	0	15
Chubbuck Fire Department	Chubbuck	Bannock	Mostly Volunteer	1	5	0	35	1	0
City of Arco Fire Department	Arco	Butte	Volunteer	1	0	10	0	0	0
City of Pocatello Fire Department	Pocatello	Bannock	Career	5	71	0	0	4	0
Downey Rural Fire Protection District	Downey	Bannock	Volunteer	1	0	12	0	0	0
Fort Hall Fire & EMS District	Fort Hall	Bingham	Mostly Career	1	16	0	5	1	0
Idaho Falls Fire Department	Idaho Falls	Bonneville	Career	5	94	0	0	4	0
INL Fire Department	Idaho Falls	Butte	Career	3	87	0	0	5	0

Table 6-17. (continued).

Fire Department Name	Mail City	County	Dept Type	Number of Stations	Active Firefighters (Career)	Active Firefighters (Volunteer)	Active Firefighters (Paid per Call)	Non-Firefighting (Civilian)	Non-Firefighting (Volunteer)
Inkom Fire Department	Inkom	Bannock	Volunteer	1	0	0	12	0	1
Lava Hot Springs Volunteer Fire Department	Lava Hot Springs	Bannock	Volunteer	1	0	12	0	4	0
Lost River Fire Protection District	Moore	Butte	Volunteer	1	0	12	0	0	0
Mackay Fire Department	Mackay	Custer	Volunteer	4	0	20	0	0	5
McCammon Fire Department	McCammon	Bannock	Volunteer	1	0	16	0	1	0
Rockland Rural Fire District	Rockland	Power	Volunteer	1	0	16	0	0	3
Shelley Firth Fire District	Firth	Bingham	Volunteer	2	0	0	40	0	0
Shelley Firth Rural Fire Dept.	Shelley	Bingham	Volunteer	1	0	0	16	0	0
Ucon Volunteer Fire Dept.	Ucon	Bonneville	Volunteer	1	0	18	0	0	0

6.9.1.3 Transportation

There are 16 airports within the 50-mile ROI providing a variety of freight and passenger transportation capabilities. They are listed in Table 6-18.

Table 6-18. Airports within the 50-mile ROI around the Atomic City site (6-018).

City	Airport Name	Distance and Location Relative to Atomic City
Atomic City, ID	Midway Airport	0.9 miles N
Atomic City, ID	Big Southern Butte Airport	12.4 miles W
Rockford, ID	Rockford Municipal Airport	22.5 miles SE
Atomic City, ID	Coxs Well Airport	26.1 miles SW
Arco, ID	Arco-Butte County Airport	28.3 miles WNW
Blackfoot, ID	Mccarley Field Airport	28.4 miles SE
Howe, ID	Howe Airport	29.6 miles NNW
Mud Lake, ID	Mud Lake/West Jefferson County/ Airport	31.9 miles NNE
Aberdeen, ID	Aberdeen Municipal Airport	36.3 miles S
Idaho Falls, ID	Idaho Falls Regional Airport	37.4 miles E
Pocatello, ID	Pocatello Regional Airport	38.5 miles SSE
Martin, ID	Hollow Top Airport	39.8 miles WSW
Minidoka, ID	Bear Trap Airport	42.3 miles SW
Grouse, ID	Antelope Valley Airport	42.6 miles WNW
American Falls, ID	American Falls Airport	44.7 miles S
Rigby, ID	Rigby-Jefferson County Airport	46.3 miles ENE

The ROI includes counties with Metropolitan Planning Organizations (MPO), which coordinate the planning and development of transportation activities within a metropolitan area. Establishment of an MPO is required by Idaho law in urban areas with populations of more than 50,000 in order for the area to use federal transportation funding. Both Bannock and Bonneville counties have MPOs to ensure coordination and cooperation among the various jurisdictions that oversee transportation within the urban areas (6-046).

Most roads within the 50-mile ROI are classified “Rural Principal Arterial” with two undivided lanes and vehicular traffic of less than 5,000 vehicles per day. Along the eastern side of the ROI, Interstate 15, a major interstate with four divided lanes, runs north-south with daily vehicular traffic of greater than 10,000 vehicles per day. The road conditions generally within the 50-mile ROI are reported as good (roughness) to fair (cracking and some roughness) (6-045).

6.9.1.4 Public Libraries

There are 13 public library facilities within the 50-mile ROI with a combined total circulation of 1,975,747 in 2004. Information regarding these facilities is listed in Table 6-19 (6-044).

Table 6-19. Libraries within the 50-mile ROI around the Atomic City site (6-001, 6-044).

Public Library Districts	Book and Serial Volumes	Subscriptions	Video Materials	Audio Materials	Total circulation	Children's Materials Circulation
Lost Rivers District	41,316	72	679	2,138	33,192	17,292
Blackfoot Public	48,686	130	1,567	1,816	139,505	59,357
Snake River School/Community	74,856	59	441	112	221,735	11,280
Aberdeen District	14,575	30	441	112	11,280	6,317
North Bingham County District	38,935	57	2,359	2,973	169,979	94,167
Idaho Falls Public	210,943	220	8,617	10,023	668,520	341,139
Portneuf District	49,104	175	689	1,141	52,021	17,875
Roberts Public	9,839	0	258	173	2,342	936
Lewisville Public	9,420	2	20	60	1,215	990
Jefferson County District	41,452	55	2,758	1,440	78,825	53,937
Marshall Public	130,367	235	4,509	2,907	442,082	205,313
American Falls District	30,123	116	1,481	1,030	82,784	37,586
Rigby Public	23,551	30	600	1,247	72,267	39,746

6.10 Population Density

Table 6-20 presents the population density for the seven surrounding counties within the ROI. The population density within a 20-mile radius of the Atomic City site is less than one person per square mile. There is approximately one person per 20 square miles in this area (6-041). Within a 50-mile radius of the Atomic City site, the population density is less than 30 persons per square mile or about 27.1 persons per square mile (6-042). The most populated areas are depicted in Figure 6-12, which shows the majority of persons residing within the population centers along the Interstate 15 corridor.

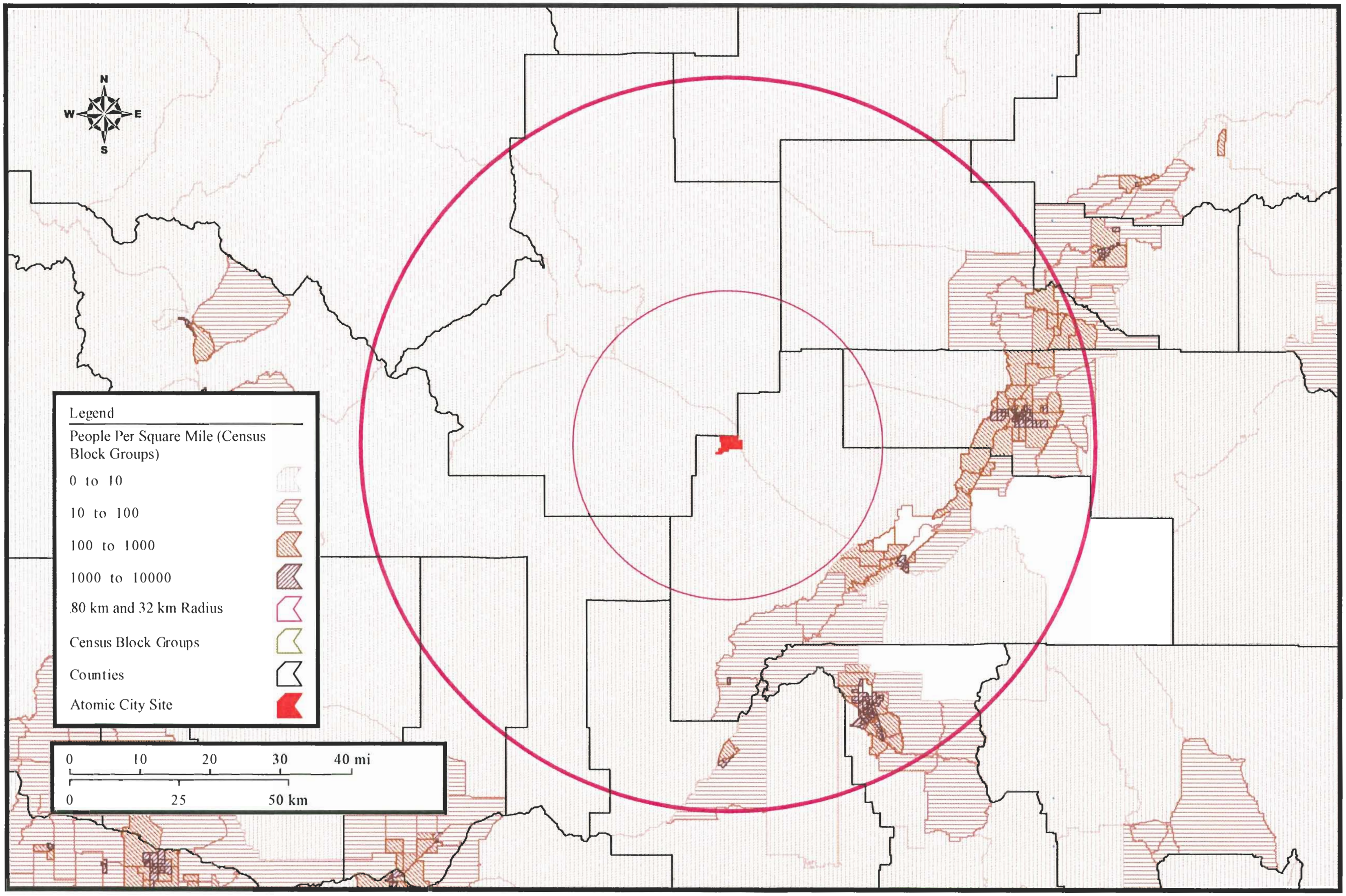

Figure 6-12. Population density within 32 kilometers (20 miles) and 80 kilometers (50 miles) of the Atomic City site (6-042).

Table 6-20. Population density of counties within the 50-mile ROI around the Atomic City site (6-041, 6-042).

County	Population Density (per kilometer^2)	Population Density (per mile^2)
Bannock	26	68
Bingham	8	20
Bonneville	17	44
Butte	0	1
Custer	0	1
Jefferson	7	18
Power	2	5

6.11 Distance from Site to Nearest Population Centers

Figure 6-13 shows the location of the Atomic City site relative to nearest population centers. This figure was developed using the underlying base map developed for Section 1, *Maps*, of this report. There are no cities within a 50-mile radius of the Atomic City site that have a population over 20,000, but less than 50,000.

Idaho Falls and Pocatello are the closest population centers to the Atomic City site that have more than 50,000 residents. Idaho Falls is approximately 55 minutes away by road east of Atomic City and Pocatello is about a 53 minute drive by road southeast of the town. Twin Falls, Idaho and Logan, Utah, are the next closest population centers with more than 50,000 residents. Salt Lake City, Utah, and Boise, Idaho, are the nearest population centers to the Atomic City site with more than 100,000 residents. They are about 215 and 282 miles by road, respectively, from the Atomic City site.

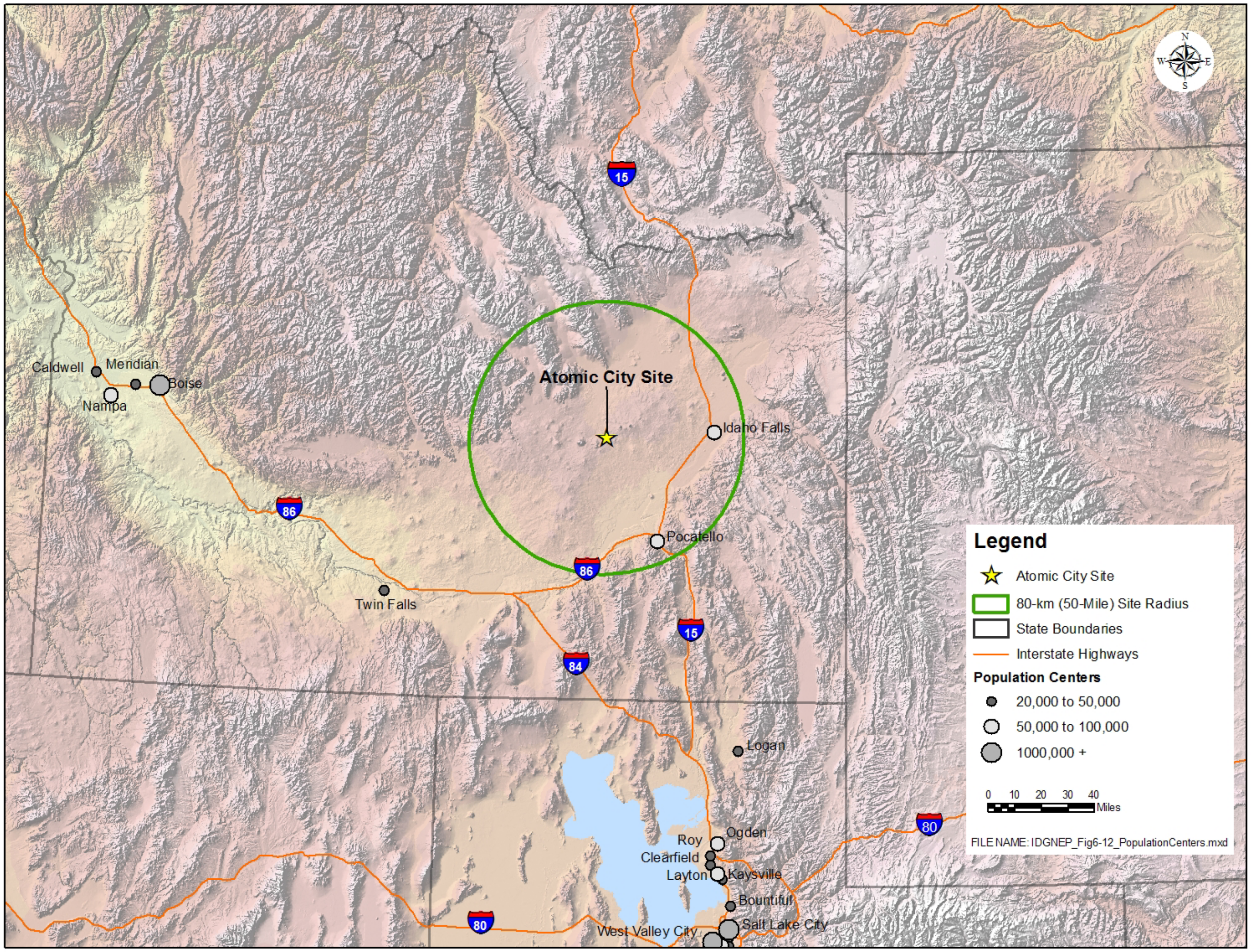

Figure 6-13. Location of population centers relative to the Atomic City site (6-041, 6-042).

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*Indicates those sources considered but not cited.

CONTENTS

FIGURES

TABLES

7. HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

Historical, archaeological, and cultural resources that occur within or near the Atomic City site that may potentially be disturbed by construction and operation of the GNEP facilities are described in this section.

Archaeological surveys were completed across the approximately 3,300 acres for the Atomic City site. Seven new sites were found within the project boundaries. Additionally, ten previously recorded sites were noted that lie near the Atomic City site. Two of the previously recorded sites were updated and recorded. These two sites and three of the newly recorded sites are eligible for inclusion on the National Register of Historic Places (NRHP).

The State Historic Preservation Office (SHPO) requires submission of a complete report according to their agency requirements. Since the SHPO report is exempt from the Freedom of Information Act, an additional report was generated wherein sensitive information was removed and is referenced in this section as appropriate.

7.1 Overview and Summary

The Atomic City site is being considered for construction of the GNEP Consolidated Fuel Treatment Center demonstration facility and/or the Advanced Burner Reactor. The Atomic City site is a privately owned 3,300 acre site located in Bingham County, Idaho. A review of the most current information based on readily available and existing files and field surveys of the Atomic City site has determined:

- There are no off-site historical, archaeological, or cultural resources that would be affected by the GNEP facilities.
- On-site historical, archaeological, and cultural properties on the site can be isolated to prevent the potential to be disturbed by construction and operation of the GNEP facilities.
- A portion of the Oregon Trail, Goodale’s Cutoff, bisects the southern portion of the Atomic City site.
- A segment of the Salmon River Railroad exists within the Atomic City site boundary.
- Seven new sites and two previous recorded sites were found within the Atomic City site boundaries.
- Three of the newly recorded sites and the two previously recorded sites are eligible for inclusion on the NRHP.
- Two of the new, eligible sites are historic sites related to homesteads. This section describes historical, archaeological, and cultural resources that occur within or are near the Atomic City site that have the potential to be disturbed by construction and operation of the GNEP facilities (7-039). If the facility is constructed on this site, potential direct impacts may include the destruction of archaeological sites or the introduction of auditory or visual elements that may compromise the integrity of existing archaeological sites. Indirect impacts to archaeological sites may include

increased visitation that may lead to looting and increased vehicular traffic that may result in the destruction of sites.

7.2 Background

This section briefly summarizes the prehistoric, ethnohistoric, and historic cultural contexts of the Atomic City site. Each is discussed separately below. For the modern environmental setting, see Section 2, *Aquatic and Riparian Ecological Communities*; Section 3, *Water Resources*; Section 9, *Geology/Seismology*; and Section 10, *Weather/Climatology*.

7.2.1 Culture History

A number of cultural historical chronologies have been developed for the prehistory of this region, which, though ethnographically part of the Great Basin Culture Area, is contiguous with the Columbia Plateau physiographic province (7-010). This report utilizes the chronology developed for the DOE in 2005 for the upper Snake River region of southeastern Idaho, specifically for the Idaho National Laboratory (7-009), which is adjacent to the current inventoried area.

7.2.1.1 Prehistory

Four general culture historic periods in the prehistory of the region—the Early Prehistoric, Middle Prehistoric, Late Prehistoric, and Historic periods—are distinguished (7-009). The Early Prehistoric period is divided into two sub-periods, the Middle Prehistoric period is divided into three sub-periods, and the Late Prehistoric period is divided into two sub-periods. All references to ages and radiocarbon dates in the following are in terms of uncalibrated radiocarbon years before present.

Clovis and Folsom spear points characterize the Early Prehistoric I sub-period (7-009). The Early Prehistoric II sub-period is marked by terminal Paleo-Indian period projectile points such as the Haskett. Northern (or Bitterroot) side-notched points and other large side-notched projectile points characterize the Middle Prehistoric I sub-period. Large, bifurcate stemmed dart points such as the Gatecliff distinguish the Middle Prehistoric II sub-period, while Elko series dart points characterize the Middle Prehistoric III sub-period. A reduction in the size of corner-notched points generally associated with the advent of bow-and-arrow technology identifies the Late Prehistoric I sub-period. The transition from the small corner-notched styles to small side-notched styles of arrow points, such as the Desert Side-notched, marks the Late Prehistoric I sub-period. The Historic period occurs when contact with Euro-Americans and their trade goods was initiated.

Early Prehistoric Period

The Early Prehistoric period dates from approximately 15,000 to 7,500 years before present (BP). The biotic regime in southern Idaho during this period was similar to modern conditions, but the climatic regime was somewhat mesic (cooler and moister than present), allowing for more available water in large, shallow ephemeral lakes. The archaeological record indicates the earliest inhabitants of southern Idaho hunted now extinct species of mammoth, camel, and horse we well as extant species such as bison and bighorn sheep (7-019).

Lithic technology during the Early Prehistoric Period I sub-period is typified by Clovis and Folsom projectile points. Clovis points exhibit a characteristic flute that extends from the base of the projectile to one third or one half the length of the point while Folsom points are smaller with flutes that extend the length of the point. Archaeologists have only recovered Clovis points as surface finds in the area (7-009).

Around 10,000 BP, projectile point styles in the region changed from fluted types to unfluted lanceolate and large stemmed points. The change in projectile point types is concurrent with the decline of Pleistocene megafauna, though big game hunting persisted through the period. Archaeologists find sites containing Early Prehistoric II sub-period projectile points in southern Idaho in association with bighorn sheep and bison, and Haskett points in association with bison remains dating between 9,800 and 10,000 BP.

Middle Prehistoric Period

The Middle Prehistoric period dates from approximately 7,500 to 1,300 BP. A proliferation of point types marks this period. Large side-notched points decrease in frequency, and, by about 4,000 BP, bifurcate-stemmed dart points (e.g., Gatecliff) become the dominant styles in this region. Additionally, large corner-notched forms such as the Elko series and smaller lanceolate points similar to the Humboldt series appear at this time (7-009). At the Wahmuza site (7-004) located 33 miles to the south, very few of the clearly Plains varieties of projectile points were manufactured from volcanic glass, yet all the Great Basin styles were.

The characteristic projectile technology of this period was the atlatl-and-dart. Use of the atlatl is inferred from the emergence of bifurcate-stemmed points and large side-notched dart points, which may represent two versions of the atlatl: one from the Great Basin represented by bifurcate-stemmed points and one from the Northwestern Plains represented by large side-notched points (7-011). On the Snake River Plain, the older of these appears to be the bifurcate-stemmed projectile point.

Groups dating to the Middle Prehistoric period appear to have practiced fortuitous, broad-spectrum subsistence. While some sites exhibit an emphasis on bison procurement (7-025), other sites exhibit a wide range of animal size and taxa or very little animal bone (7-011, 7-020). At the Wahmuza site (7-004), a hopper mortar base and numerous notched cobbles—ethnographically known on the Columbia Plateau as fishing weights—were recovered. Additionally, the Wahmuza lanceolate was recovered from the component dating to this period and all subsequent components at the Wahmuza site.

The Middle Prehistoric III sub-period occurs from about 3,600 to 1,250 BP (7-009). A wide variety of projectile point styles mark this period; however, large corner-notched dart points, such as the Elko, predominate. At the Wahmuza site (7-022), ceramics appear during this period. Rosegate points appear toward the end of this sub-period, as well as several small side-notched points similar to the Avonlea style from the Great Plains.

Various lines of evidence suggest that the groups present during this period may have formed the population base from which the subsequent sub-period(s) developed. Holmer (7-013) notes continuity in the archaeological record that may extend to 4,000 BP, while Swanson (7-025) pushes the date to 8,000 BP.

Late Prehistoric Period

The Late Prehistoric I sub-period extends from approximately 1,200 to 700 BP, and the Late Prehistoric II sub-period extends from about 700 to 150 BP. A reduction in size of corner-notched projectile points to varieties such as the Rosegate marks the Late Prehistoric I sub-period (7-009). These projectile points are associated with bow and arrow technology. Additionally, ceramics occur sporadically during this sub-period.

The Late Prehistoric I sub-period includes Occupations III and IV at the Wahmuza site (7-004). During these occupations, diet appears similar to the preceding Middle Prehistoric III sub-period, though no bison remains occurred at this site. Small and large corner-notched points were coeval and equal in frequency, although the Desert Side-notched constitute a quarter of the assemblage. Both the Wahmuza lanceolate and the notched cobbles persist into this period. Many of these cultural elements occur as part of the material culture of the historic Numic people (7-015, 7-028, 7-013).

The Late Prehistoric II sub-period occurs from approximately 700 to 150 BP (7-009). Small side- and tri-notched projectile points such as the Desert Side-notched characterize this sub-period. Horses and European trade goods may have reached the area by 300 BP. Prehistoric pottery is also common. At the Wahmuza site (7-004), Occupations V and VI date to this sub-period. Occupation V contained the majority of a flat-bottomed Intermountain ware pot in association with Desert Side-notched points. A subsistence strategy heavily focused on the procurement of large animals also typifies this sub-period. Conversely, evidence of plant or plant processing during this period is rare. It is unknown whether this pattern reflects a genuine lack of emphasis on the exploitation of plant resources, exploitation of different plant resources, different spatial organization of camp and procurement/processing areas, season of occupation, or sampling error.

Historic Period

The Historic period extends from 200 to 150 BP. The early date designates the first contact between Native Americans and Euro-Americans in Idaho made by Lewis and Clark. The later date signifies increased western emigration by Euro-Americans and an economic shift to the reliance on Euro-American trade goods. Local Native American groups had some items of Euro-American origin (for example, horses), and certain Shoshone bands possessed horses since around 250 BP. Metal beads, cloth, and shells were also traded from the Spanish or people who had been in contact with the Spanish. The main Euro-American influence in the region in the early nineteenth century was fur trappers. The opening of the Oregon Trail brought more Euro-American emigrants in the mid nineteenth century. The arrival of the trappers and emigrants disrupted the Native American lifeway on the Eastern Snake River Plain. Often trappers hunted game to near extinction, eliminating important sources of food (7-018).

7.2.1.2 Ethnohistory/Ethnography

The earliest ethnography of the Shoshonean lifeway is Lowie (7-016). Lowie’s investigations occurred at the Lemhi Reservation in east-central Idaho, and many of his informants lived prior to the formation of reservations. This group, the Lemhi, annually journeyed to the plains to hunt bison; thus, they exhibited many traits of the Plains tribes. Steward (7-030) revised Lowie’s investigation by shifting the focus of cultural affiliations to the Great Basin. The government had terminated the Lemhi Reservation by the time of Steward’s investigations and moved those inhabitants to Fort Hall (7-021). Overall, the Shoshone assimilated varying degrees of Plains, Columbia Plateau, and Great Basin cultural traits in response to various economic conditions encountered in different areas.

Prior to the acquisition of the horse, the lifeway consisted of groups composed of highly mobile nuclear families or family clusters, egalitarian in nature, which practiced adventitious, wide-spectrum subsistence. The general subsistence pattern consisted of seasonal rounds to areas of resources (Figure 7-1). Hunting, fishing, and gathering characterized spring and summer. Migration to the mountain ranges for nuts characterized autumn, when they gathered, roasted, and cached them for winter use. The Shoshone spent winter at various camps along rivers and streams. The Shoshone harvested fish primarily in the spring, when the stores of bison meat were running low. After acquisition of the horse, they exploited available resources more efficiently and formed loosely cohesive bands for special purposes (7-023).

The ethnographic and ethno-historic literature identifies the Northern Paiute, who associated with the Northern Shoshone, as the "Bannock" (7-030). Aside from linguistic differences, the Northern Shoshone assimilated this group insofar as culture and technology. After the acquisition of the horse, the Northern Shoshone traveled onto the Plains and expanded their territory to the Saskatchewan Plains and to the upper Missouri River (7-023).

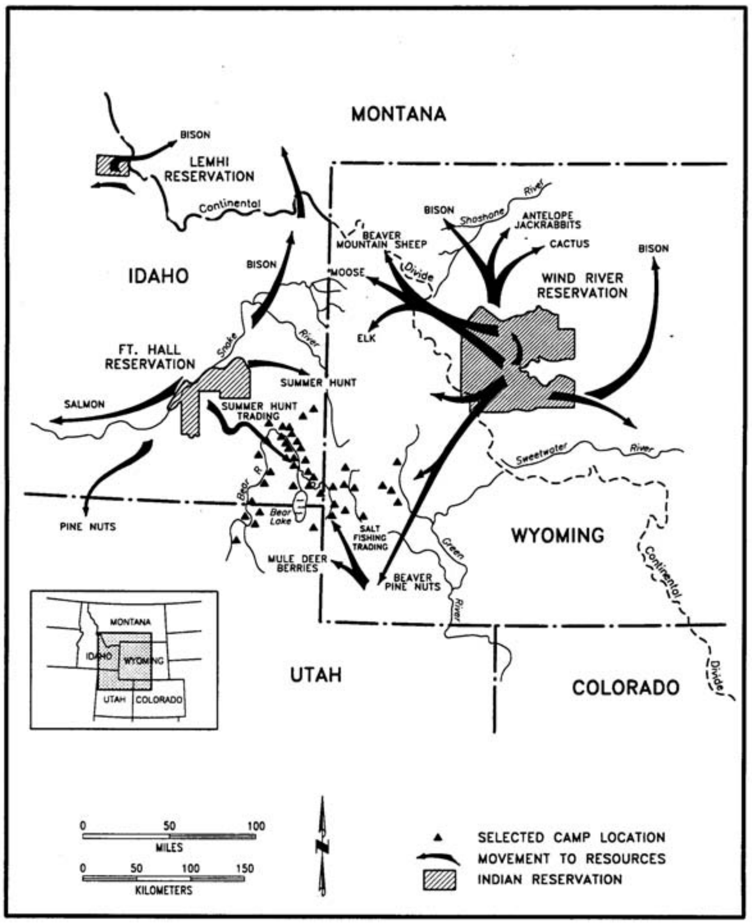

Figure 7-1. Seasonal migrations of the historic Shoshone-Bannock (7-023, 7-030).

7.2.1.3 History

The first Euro-Americans to enter the region were members of the Lewis and Clark expedition in 1805. Other trappers and explorers traveled through the region in the 1820s and 1830s. Nathaniel Wyeth came west in 1834 and built Fort Hall. Accompanying Wyeth on his journey was Jason Lee, a Methodist minister sent to Oregon. Lee returned to New England to recruit settlers and arrived back in Oregon in

1840. The route they traveled became the Oregon Trail, which was the primary emigrant route to the west. Fort Hall served as a supply center for emigrants until 1856 (7-009).

The Oregon Trail roughly follows the Snake River, and traffic on the Oregon Trail began in earnest during the 1840s. A branch of the Oregon Trail, Goodale's Cutoff, is located within the current Atomic City site. The route diverts from the main trail at Fort Hall and continues west past Big Southern Butte to Camas Prairie where it reconnects with the main Oregon Trail at Ditto Creek (Figure 7-2). The first Oregon-bound emigrants followed Goodale's Cutoff in 1852 (7-014).

Several federal laws fostered irrigation and other development projects, these laws were instrumental to the settlement of the area and local economic expansion. Water users formed irrigation companies that led to dam and canal construction.

Figure 7-2. Goodale's Cutoff from the Oregon Trail.

A Presidential Order established the Fort Hall Reservation for the Shoshone and Bannock in 1867, which was confirmed by the 1868 Fort Bridger Treaty. The first long-term Euro-American settlers in southeastern Idaho raised livestock. Sheep proved superior for grazing in the area. The Oregon Short Line Railroad was built in 1884. Cattle ranching, also initially important, decreased after the cold winters of the 1880s (7-009). Intensive farming did not occur until the construction of irrigation canals in the late nineteenth and early twentieth centuries.

7.3 Methods

The following section outlines the methods used for the field survey and the evaluation of the archaeological sites.

7.3.1 Field Survey and Methodology

An intensive survey within the Atomic City site, composed of approximately 3,310 acres, was conducted. Rodent burrows and cut banks were thoroughly examined for evidence of subsurface archaeological deposits. The field survey methodology, as defined in the Field Survey Plan prepared for this siting study project, conformed to established procedures established by the SHPO for intensive pedestrian surveys. Field survey forms and reports that document the survey were prepared in accordance with SHPO standards. The field crew chief briefed crew members prior to initiation of field work to clearly identify the cultural resources that might be encountered and information that must be documented in order to prepare SHPO forms. Three crew chiefs and six archaeological technicians conducted the inventory utilizing transects spaced no more that 100 feet apart. Archaeological and historical sites were recorded using a Geoexplorer 3 Global Positioning System (GPS). The site boundaries and large features within sites were mapped as polygons, while small features and artifacts were mapped as points. The North American Datum (NAD) 27 was used to obtain the location of the various sites and artifacts, which were projected to the UTM grid to comply with SHPO standards.

7.3.2 Evaluation of Significance

Most historical and archaeological sites were evaluated according to the criteria of eligibility for inclusion on the NRHP:

The quality of significance in American history, architecture, archaeology, engineering and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and:

a. that are associated with events that have made a significant contribution to the broad patterns of our history, or

b. that are associated with lives of persons significant in our past, or

c. that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction, or

d. that have yielded, or may be likely to yield, information important in prehistory or history.

Archaeological sites that were recorded prior to the establishment of the criteria are unevaluated and some sites require additional investigations to determine their NRHP eligibility.

7.4 Results

This section presents the results of the file search and field inventory.

7.4.1 File Search Results

A file search conducted at the SHPO in Boise, Idaho on February 5, 2007, revealed 11 previous inventories (Table 7-1) and two previously recorded sites near the Atomic City site (7-001). Eight other sites have been recorded that are not associated with projects.

Table 7-1. Previous studies conducted in the area.

SHPO Report Number	Report Title	Author	Date	Acres	Archaeological Sites Near Survey Area[1]
1989/979	A Report on the 1967-69 Archaeological Survey of the National Reactor Testing Station	B.R. Butler	1970	0	None
1989/1837	Class II Cultural Resource Inventory of Areas within and Adjacent to the Big Desert Planning Unit, Idaho	J. Franzen	1980	0	None
1989/1991	Annual Report of Archaeological Investigations 1979, 1980	J. Gaston	1981	0	None
1989/1993	Annual Report of Archaeological Investigations 1983	J. Gaston	1983	0	None
1989/4899	A Cultural Resources Inventory of the Perimeter Boundary, Grazing Boundary, and 1984 Project Areas	S. Miller	1985	7037	None
1989/5629	An Archaeological Survey for the Idaho National Engineering Laboratory Perimeter Sign Maintenance Project	W. Reed and R. Holmer	1987	860	None
1989/2782	Cultural Resource Clearance Worksheet (CRCW), Cedar Butte Cattleguard	R. Hill	1988	1	None
1994/631	U.S. West Communications Pocatello-Arco Fiber Optic Line Right-of-Way IDI-364, BLM	J.M. Furniss and D. Sammons	1994	299	None
1995/126	Atomic City Powerline Right-of-Way	R. Hill	1994	80	10BM376
2003/407	Atomic City Fire Station	C. Wells	2003	8	None
2002/361	Big Desert Fuel Breaks	T. Hoffert	2002	2720	10BM700

[1] Previously recorded archaeological sites located within 1 mile of the Atomic City site associated with these projects.

A summary of the 11 previous inventories is provided below:

1. Butler, B. Robert. 1970. *A Report on the 1967-69 Archaeological Survey of the National Reactor Testing Station*. The report presents the results of surveys conducted for the INEL in 1970. Although some sites were located, none were recorded near the inventoried area.

2. Franzen, John. 1980. *Class II Cultural Resource Inventory of Area Within and Adjacent to the Big Desert Planning Unit, Idaho*. No further information about this project is available.

3. Gaston, Jenna. 1981. *Annual Report of Archaeological Investigations 1979, 1980.* This is a summary report of projects that occurred around the State of Idaho. Although a project occurred in the general area, it is unknown whether a site is associated with that project.

4. Gaston, Jenna. 1983. *Annual Report of Archaeological Investigations 1983.* This is a summary report of projects that occurred around the State of Idaho. Although a project occurred in the general area, it is unknown whether a site is associated with that project.

5. Miller, Susanne. 1985. *A Cultural Resources Inventory of the Perimeter Boundary, Grazing Boundary, and 1984 Project Areas.* This report details the results of several inventories conducted for the INEL. No sites were recorded near the inventoried area.

6. Reed, William and Richard Holmer. 1987. *An Archaeological Survey for the Idaho National Engineering Laboratory Perimeter Sign Maintenance Project.* This report details the results of a linear inventory conducted for the INEL. No sites were recorded near the inventoried area.

7. Hill, Richard. 1988. *CRCW, Cedar Butte Cattleguard*. This report details the results of a Class III inventory for a cattleguard by the BLM. This inventory was conducted with negative results.

8. Furniss, J.M. and D Sammons. 1994. *US West Communications Pocatello-Arco Fiber Optic Line Right-of-Way IDI-364, BLM*. This report details the results of a Class III inventory along the highway right-of-way. No sites were recorded near the inventoried area.

9. Hill, Richard. 1994. *Atomic City Powerline Right-of-Way*. This report details the results of a Class III inventory conducted by the BLM. Site 10BM376 was recorded as a result of this project.

10. Wells, Colleen. 2003. *Atomic City Fire Station.* The report details the results of a Class III inventory conducted by North Wind, Inc. in support of an Environmental Assessment (EA) for the fire station. This inventory was conducted with negative results.

11. Hoffert, T. 2002. *Big Desert Fuel Breaks.* This report details the results of a Class III inventory of fuel breaks in the region. Site 10BM700 was recorded as a result of this project.

General Land Office (GLO) plats and homestead patents (7-006) were also examined for the possibility of historic roads and homesteads in the Atomic City site. In 1924, one parcel of patented land located in the Atomic City site had the title transferred to the State of Idaho under the Idaho Territorial Act (12 Stat. 808) of 1863. In 1989, the State of Idaho transferred the same parcel to the BLM under the Exchange-State Act Section 206 (90 Stat. 2743) of 1976. Table 7-2 summarizes the previously recorded sites.

7.4.2 Previously Recorded Sites

Ten sites were previously recorded within 1 mile of the Atomic City site. Two of the sites, Goodale's Cutoff from the Oregon Trail and the Salmon River Railroad, both are eligible for inclusion on the NRHP.

Table 7-2. Previously recorded sites within and near the Atomic City site.

Site No.	Type of Property	Artifacts/Features	NRHP Eligibility	NRHP Criteria
10BM33	Rockshelter	Flakes	Unevaluated	Unknown
10BM46	Isolate?	Cylindrical stone fragment	Unevaluated	Unknown
10BM58	Lithic Scatter	Projectile points, flakes	Unevaluated	Unknown
10BM59	Lithic Scatter	Projectile points, flakes	Unevaluated	Unknown
10BM305	Goodale's Cutoff	Trail	Eligible	A, D
10BM376	Lithic Scatter	Flakes	Eligible	D
10BM700	Isolate	Flakes	Not Eligible	N/A
10BT255	Lithic Scatter	Tools, flakes	Unevaluated	Unknown
10BT1325	Isolate	Projectile point	Not Eligible	N/A
11-18004	UPRR	Railroad	Eligible	A

7.4.3 Newly Recorded Sites

Seven newly recorded and two previously recorded sites were encountered and documented during the inventory (Table 7-3). The archaeological standard for describing archaeological and historical sites state that metric measurements be used for prehistoric sites and English measurements be used for historical sites. The seven new sites are described in Section 7.3.1 and the previously recorded sites are described in Section 7.3.2. It should be noted that the SHPO will make the final determination on NRHP eligibility.

Table 7-3. All sites recorded in the area.

Field No.	Site No.	Type of Property	Artifacts/Features	NRHP Eligibility	NRHP Criteria
Newly Recorded Sites					
GNEP-1	N/A	Trash Scatter	Cans, Glass	Not Eligible	—
GNEP-2	N/A	Trash Scatter	Cans, Glass	Not Eligible	—
GNEP-3	N/A	Homestead	Depression, Cans, Glass	Eligible	A, D
GNEP-4	N/A	Trash Scatter	Cans, Glass	Not Eligible	—
GNEP-5	N/A	Lithic Scatter	Flakes	Eligible	D
GNEP-6	N/A	Projectile Point	Isolated Artifact	Not Eligible	—
GNEP-7	N/A	Homestead	Foundations, Glass, Cans	Eligible	A, C, D
Previously Recorded Sites					
N/A	10BM306	Historic Railroad	Union Pacific Railroad, Culvert	Eligible	A, C, D
N/A	11-18004	Historic Trail	Goodale's Cutoff	Eligible	A, D

Site Descriptions

GNEP 1

The site consists of a historic artifact scatter. It is composed of glass fragments, can fragments, porcelain fragments, stoneware, and a white milk glass jar marked “Jergens.” Artifacts include a jar base, 13 clear glass fragments, one brown bottle fragment, one “Vicks” cobalt blue bottle fragment, four can fragments, one fragment of white milk glass, two fragments of stoneware, one whiteware fragment with orange slip on each side, one fragment of white porcelain marked “SHENANGO,” and four tin can fragments.

The site is located on a very slight north-facing slope in a formerly plowed field southwest of Atomic City. The site is located just south of a two-track road. The soil is brown aeolian silt loam. Vegetation includes an overstory of crested wheatgrass and cheatgrass with an understory of unidentified forbs.

This site is not eligible for inclusion on the NRHP under any criteria. It is indeterminable whether it is associated with events or persons significant in our past (Criteria A and B), and it exhibits no special or unique characteristics of design or construction (Criterion C). It is unlikely to have the potential to yield additional information (Criterion D). Recordation exhausts its research value.

GNEP 2

This site consists of a historic trash scatter. It is composed predominantly of hundreds of green, clear, and brown glass; some ceramic sherds; and tin can fragments. The glass assemblage consists of bottle fragments that were all manufactured on an automatic bottling machine. Glass includes 144 clear glass fragments, one fragment from a soft drink bottle, one tumbler base, the neck and screw-top finish from a bottle, and one base with a kick-up. Seventy one brown glass fragments include 67 nondiagnostic brown glass body shards, the neck from a possible liquor bottle, a base that has “4512” “3” and a “G” that overlaps a “C” embossed on its base, and one base. The 23 aqua glass fragments derive from bottles. Thirty-seven green glass fragments were also located. Other glass artifacts include a white milk glass shard, and a cobalt blue jar with “Vicks Vaporub” and double “Vs” embossed on it.

The can assemblage consists of 36 nondiagnostic tin can fragments with crimped and locked seams, indicating recent manufacture. Ceramics consist of five whiteware sherds. One plastic button was also located.

This site is located in a small depression overlooking an ephemeral drainage to the west. Deposits are colluvium and consist of light yellowish brown silty loam with a few angular to subangular cobble and pebbles. Vegetation consists mainly of Indian ricegrass, cheatgrass, and crested wheatgrass with lesser amounts of big sagebrush, rabbitbrush, broom snakeweed, and Russian thistle.

This site is not eligible for inclusion on the NRHP under any criteria. It is indeterminable whether it is associated with events or persons significant in our past (Criteria A and B), and it exhibits no special or unique characteristics of design or construction (Criterion C). It is unlikely to have the potential to yield additional information (Criterion D). Recordation exhausts its research value.

GNEP 3

This site consists of homestead remains shown on the 1914 GLO map. It is composed of a depression (Feature 1), wood scatter (Feature 2), and numerous tin can and glass fragments. Feature 1 is located near the north edge of the site. A plywood fragment is near the southwest end of Feature 1. Most of the wood (Feature 2) is near the east side of the site, including a railroad tie that is embedded in the ground like a post. A total of 91 artifacts was observed. The tin can assemblage consists of 64 artifacts. Thirty-nine of the artifacts consist of hole-in-top cans. Simonis (7-029) dates these cans between 1917 and 1929. Eighteen cans are sanitary (similar to modern cans). Two cans appear to be motor oil. One cone-top beer can was also observed on the site. Four additional cans were found at this site and include one rectangular, 1-gallon gas can; a 5-gallon paint can; a paint can lid; and a modern sanitary can.

The glass assemblage contains 14 artifacts. Six consist of clear glass bottle fragments; two consist of "KERR" clear glass canning jars; one consists of a clear, square, bottle base with no markings; one consists of a pyrex-type baking pan fragment that still has a handle present; and one consists of a clear glass bottle neck with a double zinc shaker lid that measures 1 inch in diameter. Other clear glass includes milk bottle fragments that have a partial, applied label that reads "ACL CREAM TOP Dairy" and "IDAHO FALLS, IDAHO." An intact clear glass, fluted, catsup bottle has "DURAGLAS" in script and "20" "1738-EP" embossed on its base, and "4-A" embossed near the base on one side was also found. Brown glass is limited to the neck and crown top finish of a bottle.

The ceramics assemblage consists of five artifacts. Three of the artifacts are whiteware with a buff paste, white glaze, and a gold annular ring design around the rim of a plate. One artifact consists of a whiteware sherd with a decal transferred floral design; it appears to be from a plate. A white ceramic electric switch is also present.

Miscellaneous artifacts include a crushed galvanized wash basin with heavy wire handle and a ribbed base; one yellow with green trim enamelware basin that has its bottom is missing; and six leather fragments—possibly harness parts.

The site is located at the north base of an east-west trending ridge. It is situated in a pocket open to the north. Deposits are colluvial with a crust of dark brown clayey loam with a few angular cobbles and pebbles. Vegetation consists of big sagebrush and rabbitbrush on the slope with clasping peppergrass, broom snakeweed, tumble mustard and Russian thistle. Idaho Fescue, cheatgrass, and crested wheatgrass become denser toward the north end of the site.

This site is eligible under Criteria A and D. It is likely part of the turn-of-the-century dry farms (1902-1920) that proliferated in the area during this period. This site dates from circa 1924 to 1950, based on artifacts present at the site. Additional archival research may yield the name of the homesteader who patented the parcel, and subsurface archaeological deposits are likely (Criterion D).

GNEP 4

This site consists of a historic trash dump. It is composed of numerous tin cans and tin can fragments; clear, brown, and purple glass; ceramics; wire nails; and scattered lumber. A total of 294 artifacts were observed. The glass assemblage consists of 246 artifacts. The clear glass is composed of 240 bottle fragments that were manufactured by an automatic bottling machine. A total of 232 fragments were nondiagnostic body shards. Bottle bases consist of one with "5" embossed on it and one with the Hazel-Atlas trademark and "5275" and "5" embossed on it. Four fragments consist of finishes to canning jars. A clear glass stopper for a jug was also located. Three purple glass nondiagnostic body shards were observed as well as two white milk glass shards and the brown glass base of a liquor bottle.

Fourteen sherds compose the ceramic assemblage. Seven of the sherds have a white paste and a teal slip, five consist of fragments of a female figurine, one is white stoneware, and one is white porcelain with a floral pattern embossed on it and a gold edge.

The tin can assemblage consists of 32 cans. Eight cans are sanitary with cut around openings. Five cans are hole-in-top; Simonis (7-029) dates these cans between 1917 and 1929. Two cans are flat-top beverage cans that were opened by a church key. Three cans are rectangular meat/ham cans. A sardine/herring can, one large can with an internal friction lid, a key-opened coffee can, and a small, key-opened, coffee can were noted. Two additional cans consist of a rectangular spice can and a conical top can that is partially crushed.

Miscellaneous artifacts include a steel band and a metal reflector.

This site is located in the south slope of a small knoll. It is situated midway up the slope of the knoll, which appears to be a quarried-out cindercone. Deposits are residual and consist of dark brown clayey loam with numerous scoria. Vegetation consists predominately of big sagebrush with lesser amounts of rabbitbrush. The understory is composed of broom snakeweed, tumble mustard, bluebunch wheatgrass, and bottlebrush squirreltail grass.

This site is not eligible for inclusion on the NRHP under any criteria. It is indeterminable whether it is associated with events or persons significant in our past (Criteria A and B) and it exhibits no special or unique characteristics of design or construction (Criterion C). It is unlikely to have the potential to yield additional information (Criterion D). Recordation exhausts its research value.

GNEP 5

This site consists of a prehistoric lithic scatter. It is composed of 17 black obsidian flakes. The flakes consist of one primary flake, six secondary flakes, and 10 tertiary flakes.

The site is located on the north slope of a small rise. The flakes are situated near the crest of the rise east of the lava margin. Deposits are aeolian and consist of dark brown silty loam. Vegetation consists of Russian thistle, tumble mustard, crested wheatgrass, and cheatgrass. This site is a fallow agricultural field.

This site is eligible for inclusion on the NRHP under Criterion D. It rests on a surface that has the potential to yield subsurface information concerning activity areas, chronology, and subsistence.

GNEP 6

This isolate consists solely of a broken projectile point (Figure 7-3). It is a large corner-notched (Elko) point that is orange-brown cryptocrystalline silicate. The point is missing the tip, but is triangular in plan view and biplano in longitudinal cross section. It exhibits random flaking. A rind of calcium carbonate on one side of the point indicates that it was buried between the B and C horizons and was recently brought to the surface.

This resource is located on a broad rolling plain. The point is situated in a broad swale between two north-south trending ridges. Deposits are aeolian and consist of dark brown sandy loam. Vegetation consists of an overstory of big sagebrush and rabbitbrush. The understory consists of broom snakeweed and crested wheatgrass.

This resource is not eligible for inclusion on the NRHP. The resource consists solely of an isolated projectile point.

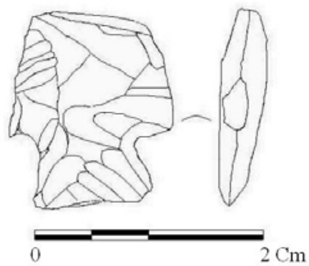

Figure 7-3. Plan view and longitudinal profile of GNEP 6.

GNEP 7

The site consists of homestead remains. It is composed of two foundations, a cistern, two depressions, and artifact scatter. The foundation, Feature 1 (F1), is composed of loosely stacked, vesicular basalt boulders and is rectangular in plan view. Remains of a hay bale are located in the southwest corner. There is no evidence of a roof. The cistern, Feature 2 (F2), is a cement-lined hole or cistern located south of F1. It is cylindrical and partially collapsed. Feature 3 (F3) is a depression located northeast of F1. Feature 4 (F4) is an irregularly-shaped rock alignment composed of a single course of vesicular basalt cobbles that extends 4 to 6 inches above ground. No south wall is visible. Feature 5 (F5) is a roughly rectangular depression. The majority of the artifacts are north and east of F1.

A total of 332 artifacts are present. The glass assemblage consists of 250 artifacts. One hundred forty glass fragments are clear of which 110 are window glass. Twenty seven are nondiagnostic bottle fragments. One consists of the finish of a jar, one is a 3-inch base that is embossed with “NC 40,” and one is the base of a liquor bottle. Purple glass accounts for 48 nondiagnostic body shards and one small melted bottle. Aqua glass accounts for 38 nondiagnostic bottle fragments, and green glass accounts for five nondiagnostic bottle fragments. Seventeen brown glass bottle fragments are also present. These include 14 nondiagnostic fragments, two broken bottles with the Owens Illinois trademark on the base and 1939 in the date portion of the trademark, and a partial mouth of a bottle that has a screw finish. One white milk glass fragment was also present.

The ceramic assemblage accounts for 21 sherds. Thirteen of the sherds are whiteware and consist of rim and body sherds. Six are crockery with a beige salt glaze and buff coarse paste. They came from a jug that had an indented ring. One whiteware sherd consists of the handle from a tea cup, and one consists of a footed plate fragment.

Forty-six cans comprise the tin can assemblage. Sixteen are too crushed to determine measurement or type. Five are crushed large, possibly lard, cans, and two consist of upright pocket tobacco tins. Three hole-in-top cans were observed. Simonis (7-029) dates these cans between 1917 and 1929. Three larger hole-and-cap cans were also noted. Two additional hole-and-cap cans have a crimped seam and puncture and pry-out lids. Five sanitary cans are present. Three cans are sardine tins that are crushed but were rectangular and key-opened. Two cans are key-opened coffee cans that are crushed. Two modern cans with puncture and pry lids are also located on the site. Other tin cans include a 2-1/2 gallon round gas can, a 1-gallon galvanized can, and a rectangular can; it has a spout and is coated with black paint.

Eight metal artifacts consist of a grill that is riveted together, a crushed pan with a handle near its rim, a galvanized sheet metal plate, a gray enamelware wash basin, three barrel hoops, and a bracket with numerous perforations. The stove vent and collar of a wood stove are also located on the site. Ammunition consists of a .22 caliber short casing with a “US” headstamp and two 45-70 casings with “WRA” headstamps.

The site is located on a slight north facing slope immediately west of an unnamed two-track road. It is situated near the crest of the slope overlooking Goodale’s Cutoff and the railroad (see Section 7.3.2). Deposits are aeolian silt loam. Vegetation includes an overstory of big sagebrush and an understory of crested wheatgrass, blue grama, and various bunchgrasses.

This site is eligible for inclusion on the NRHP under Criteria A, C, and D. Under Criterion A, it is associated with events significant in our past, namely the settlement of the west and may either be associated with Goodale’s Cutoff, the subsequent stage road, or the railroad. It is indeterminable whether the site is associated with persons significant in our past; additional archival research may indicate its historical function and whether it is associated with persons significant in our past, and thus, could become eligible under Criterion B. The basalt construction and cement-lined cistern are unique characteristics of design or construction (Criterion C). The site has the potential to yield additional significant information (Criterion D) concerning the ethnicity of the occupants, demography, and consumption patterns.

7.4.4 Previously Recorded Site Descriptions

Site 10BM306 (Goodale’s Cutoff)

This site consists of Goodale’s Cutoff from the Oregon Trail, which became a stage road in the latter half of the 19th century. The portion of the trail within the inventoried area consists of two segments. One segment (Segment 1) extends from the south boundary of the Atomic City site and retains the character, setting, and feeling of the trail. The second segment (Segment 2) consists of a crowned-and-ditched gravel road that no longer retains any physical integrity of the trail; however, it is indeterminable whether remnants of the trail are present beneath the current grade without testing. Segment 1 has the appearance of a single-track trail and measures 6 feet wide within a slight swale. Goodale’s Cutoff, though explored and used earlier, was first used as part of the Oregon Trail in 1852. Emigrant diaries note that rocks and trees along the trail had been carved with earlier traveler’s names and dates, though none were located during the current inventory.

The site is situated on the upper portion of the Snake River Plain relatively near the Big Lost River. Deposits are generally loessial, consisting of brown aeolian silt over basalt bedrock. Vegetation includes an overstory of big sagebrush and an understory of crested wheatgrass, blue grama, and various bunchgrasses.

This site has been previously determined to be eligible for inclusion on the NRHP. North Wind concurs with that recommendation. The trail is eligible under Criterion A because it is one of the early routes across the west and aided in its settlement. Its use as a late nineteenth century stage road also facilitated settlement and transportation in the area. It is also eligible under Criterion D. It has the potential to yield additional significant data in relation to its campsites to determine demography and consumption patterns.

Site 11-18004 (Salmon River Railroad/Union Pacific Railroad)

This site consists of the Union Pacific Railroad line between Blackfoot and Arco, Idaho. The resource consists of a northwest to southeast alignment, grade, ballast, and a single set of tracks as well as a rock culvert. This line was originally called the Salmon River Railroad and was established in 1901 and completed in 1910. Though specific dates are unknown, the line was subsequently taken over by Union Pacific and is currently in use. The railbed supports a single set of running tracks set on top of wood ties. One rock culvert, likely dating from the original period of construction, was located (Figure 7-4). No switches, telegraph remains, or other constituents of the railroad infrastructure were located.

The site is situated on the upper portion of the Eastern Snake River Plain. Deposits are generally loessial, consisting of brown aeolian silt over basalt bedrock. Vegetation includes an overstory of big sagebrush and an understory of crested wheatgrass, blue grama, and various bunchgrasses.

Figure 7-4. 1901 rock culvert on the Union Pacific Railroad.

While the tracks have been regularly maintained, the railbed itself has not altered its course since it was initially developed and is eligible for inclusion on the NRHP under Criteria A, C, and D. Under Criterion A, the site is associated with early travel and settlement of the region as well as economic and community development. Under Criterion C, although it has been regularly maintained, construction events may be preserved within the grade that may impart data on design and development of early twentieth century railroad construction. Under Criterion D, the site has the potential to yield significant information concerning ethnicity of construction crews through the excavation of work camps, demography of the crews, environmental modification to the landscape, and ethnicity and demography of the travelers.

7.5 Evaluations and Recommendations

All sites were evaluated for eligibility to the NRHP.

7.5.1 Cultural Resource Eligibility Evaluations

Newly recorded sites GNEP-1, GNEP-2, GNEP-4, and GNEP-6 are not eligible for listing on the NRHP. No further investigation or evaluation of these sites is necessary.

Sites 10BM306, 11-18004, and newly recorded sites GNEP-3, GNEP-5, and GNEP-7 are eligible for listing on the NRHP. GNEP-3 and 11-18004 are eligible under Criteria A and D.

GNEP-5 is eligible under Criterion D. GNEP-7 and 10BM306 are eligible under Criteria A, C, and D. If construction activities ultimately associated with the proposed GNEP facilities avoid these cultural resource sites, there would be no impact.

7.5.2 Management Recommendations

Avoidance of all sites, particularly historic properties, is recommended. The whole 3,310-acre area was inventoried in order for DOE to avoid eligible cultural resources.

Sites GNEP-1, GNEP-2, GNEP-4, and GNEP-6 are recommended as ineligible for inclusion on the NRHP. The project can proceed with no effect on these properties. Sites GNEP-3, GNEP-5, and GNEP-7 are recommended as eligible for inclusion on the NRHP. Avoidance of these sites is recommended. These recommendations are summarized in Table 7-4. Sites 10BM306 and 11-18004, are eligible for listing on the NRHP. Avoidance of these sites is recommended.

Table 7-4. Relationship of cultural properties to potential project impacts.

Field No.	Site No.	Type of Property	NRHP Eligibility	Effect
Newly Recorded Sites				
GNEP-1	—	Trash Scatter	Not Eligible	None
GNEP-2	—	Trash Scatter	Not Eligible	None
GNEP-3	—	Homestead	Eligible	None if avoided
GNEP-4	—	Trash Scatter	Not Eligible	None
GNEP-5	—	Lithic Scatter	Eligible	None if avoided
GNEP-6	—	Projectile Point	Not Eligible	None
GNEP-7	—	Homestead	Eligible	None if avoided
Previously Recorded Sites				
—	10BM306	Historic Railroad	Eligible	None if avoided
—	11-18004	Historic Trail	Eligible	None if avoided

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* Indicates those sources considered but not cited.

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FIGURES

8. FUTURE PROJECTS

This section describes any known federal and non-federal projects in the vicinity of the Atomic City site, within 5 miles of the outer site perimeter (see Figure 8-1) that may contribute to the cumulative environmental impacts of the proposed GNEP Facilities, including future infrastructure projects required to support any new facilities.

Within Butte and Bingham counties the existing surrounding ownership is comprised of federal (INL and BLM), State of Idaho lands, and privately-owned land.

- INL is adjacent to the Atomic City site. The Comprehensive Facility and Land Use Plan (8-001) projects the land use of INL site facility for the next 100 years. The DOE is currently scheduled to maintain ownership for the INL lands and facilities until the year 2095 with no new plans of development at this time.

- Bingham County covers the Atomic City site to the south of the INL facility. The Bingham County Board of Commissioners has an established comprehensive plan that does not contain any projected changes to the area surrounding Atomic City for the next 20 years.

8.1 Idaho National Laboratory

The INL is adjacent to the Atomic City site. The March 1996 *INEL Comprehensive Facility and Land Use Plan* (8-001) projects the land use for the INL site facility for the next 100 years. There are several on-going projects at the INL located in areas of the INL site that are outside the 5-mile radius boundary of the Atomic City site. These projects include:

- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Environmental Restoration,

- Voluntary Consent Order activities,

- Advanced Mixed Waste Treatment Project (AMWTP),

- Radioisotope Power System consolidation, and

- Integrated Waste Treatment Unit (IWTU).

The DOE is currently scheduled to maintain ownership of the INL lands and facilities until the year 2095. The INL is a science-based, applied engineering national laboratory that continuously seeks additional appropriations for future missions. It is anticipated that the general public will recommend that the Federal Government maintain control over the facility planning and management until 2095 (8-002).

8.2 Bingham County

Bingham County covers the Atomic city site and is located south of the INL facility. Based on phone conversations with the Planning and Zoning Department there are no current requests for changes to planning or zoning in the area of Atomic City (8-003). The Bingham County Board of Commissioners has an established comprehensive plan that was last revised in March of 2005 (8-004). The plan does not contain any projected changes to the area surrounding Atomic City for the next 20 years.

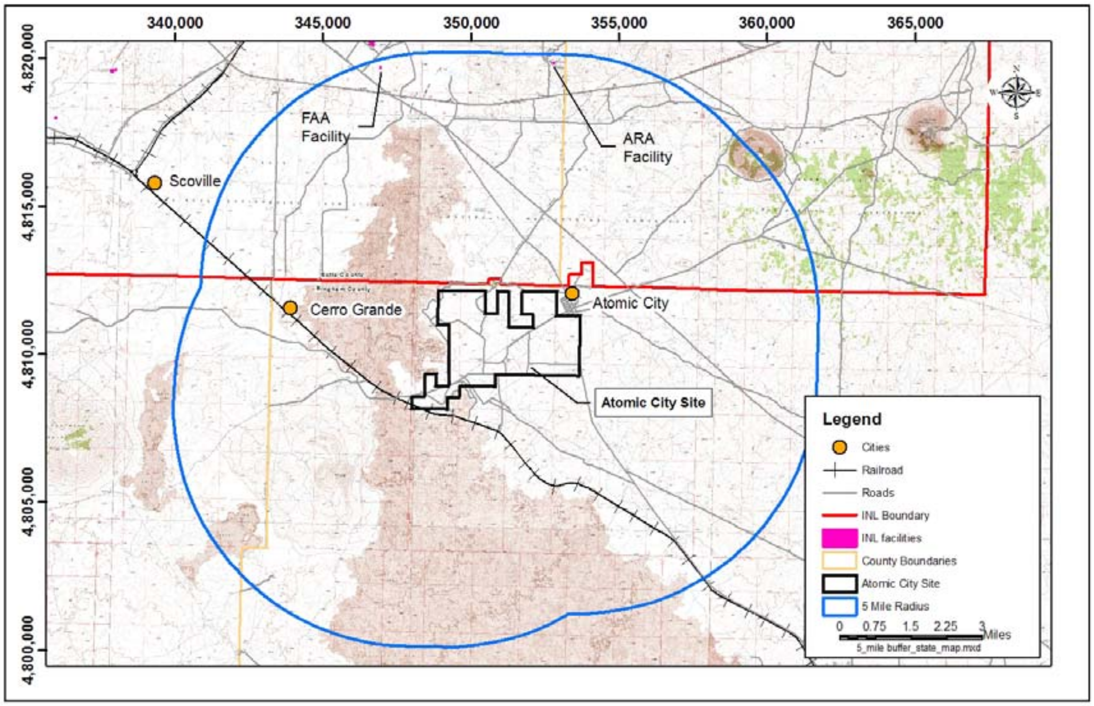

Figure 8-1. Five-mile buffer zone from outside perimeter of proposed Atomic City site.

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9. GEOLOGY / SEISMOLOGY

This section establishes the geologic and seismic context of the Atomic City site. As defined by report requirements, the Atomic City site location is identified and geologic and seismic characteristics are described. This includes surface faulting, ground motion including peak ground acceleration (PGA) and a chance of exceeding this peak, and foundation conditions. The seismic zone and capable faults within a 200-mile radius of the Atomic City site are evaluated. Map base information is derived from maps in Section 1, *Maps*. Sources of overlay data used to generate maps in this section are referenced in figure captions.

9.1 Overview and Summary

This overview summarizes the current geologic and seismologic conceptual model of the Atomic City site as presented in detail throughout Section 9, *Geology/Seismology*.

Figure 9-1 depicts the current geological conceptual model of the ESRP in the vicinity of the Atomic City site. This conceptual model consists of key geologic and structural features, particularly those that contribute to the aseismic character of the plain (See Figure 9-2). These features include the structural basin and thick accumulation of volcanic rocks of the plain, bounded by Basin-and-Range mountains and valleys to the northwest and southeast, and by the Yellowstone Plateau to the northeast.

The ESRP is a northeast-trending structural and topographically downwarped basin that formed as the North American Continental Plate drifted to the southwest across a stationary mantle plume “hot spot.” Eruption of silicic lava derived from melted crustal granitic rocks and subsequent caldera collapse resulted in the formation of this large structural basin along the “hotspot” path. As much as 8,000 feet of Tertiary silicic volcanic rocks occur at depth beneath the plain. These rocks consist of rhyolitic to andesitic ash-flow tuffs and agglomerates erupted from volcanoes (9-002, 9-033).

Subsequent eruption of basalt derived from mantle material covered the silicic volcanic rocks. Basaltic volcanism has occurred predominantly along the axis of the ESRP and along northwest-trending volcanic rift zones. Several volcanic rift zones are aligned with known Basin-and-Range extensional faults, but others are not associated with known faults (9-025). Basalts beneath the Atomic City site may be from 2,200 to 3,800 feet thick (9-086), although thickness elsewhere may be as much as 5,000 feet (9-002). This basaltic mass consists of a complex sequence of layered basalt flows erupted from low-shield volcanoes, vents, fissures, and lava tubes concentrated primarily in volcanic rift zones. In places, basalt flows are intercalated with layers of clay, silt, sand, and gravel up to 40 feet thick that accumulated during quiescent (i.e., non-volcanic) periods. The Atomic City site is located on the Axial Volcanic Zone (AVZ), a region of particularly thick basaltic deposition and few sedimentary interbeds (9-028, 9-029). The basalts at the Atomic City site are overlain by a thin mantle of unconsolidated eolian loess and minor fluvial sediments, generally 10 feet or less in thickness (9-002). Recent basalt flows adjacent to the Atomic City site are age-dated at 12,000 to 13,000 years (9-026). These flows are of limited areal extent.

Mountains and valleys of the Basin-and-Range Province adjoining the ESRP are defined by normal, high-angle, range-front faults oriented to the south and southeast. These range-front tectonic faults do not extend onto the plain (9-027). Volcanic rift zones on the plain that are aligned with several of these faults do not show any fault displacement. A total of 35 capable faults, as defined by the Nuclear Regulatory Commission (NRC), are located within 200 miles of the Atomic City site. Most of these faults occur within rocks of the Basin-and-Range Province and do not extend onto the ESRP. Twenty-six of these faults are more than 50 miles away. Nine faults are between 20 and 50 miles away. No capable faults are within a 20-mile radius (9-095).

The Basin-and-Range Province is seismically active around the margins of the ESRP. However, the plain itself is relatively aseismic (Figure 9-2), likely because of the thick sequence of volcanic rocks that attenuate seismic energy. Additional key information about the geology and seismology of the ESRP in the vicinity of the Atomic City site includes:

- Volcanic hazard analyses were conducted at the INL in 1994. Subsequent studies have demonstrated that further analysis of volcanic hazards will be required for any facility on or near the INL.

- The historical earthquake record shows that the ESRP is seismically quiet (aseismic) relative to the surrounding Basin-and-Range Province. Since the installation of local seismic networks in 1971, only 29 small magnitude microearthquakes have been detected within the ESRP. In contrast, thousands of earthquakes have occurred in the Basin-and-Range Province surrounding the ESRP.

- The 1983 Borah Peak earthquake, located approximately 68 miles from the Atomic City site, produced the highest recorded horizontal PGA in the project area, equal to 0.078g. The USGS National Seismic Hazard Map program predicts PGA values from 0.068g to 0.120g for the Atomic City site.

- No capable faults are located within a five-mile radius of the Atomic City site. The Howe section of the Lemhi fault is closest at 25.5 miles to the north. The next closest structure is the Arco section of the Lost River fault at 28 miles to the northwest. These faults are outside the ESRP.

- No faults have been identified in association with tension cracks and eruptive fissures within the late Pleistocene-Holocene lava fields.

- Compressive strength of the basalt ranges from approximately 3,000 to 15,500 pounds per square inch.

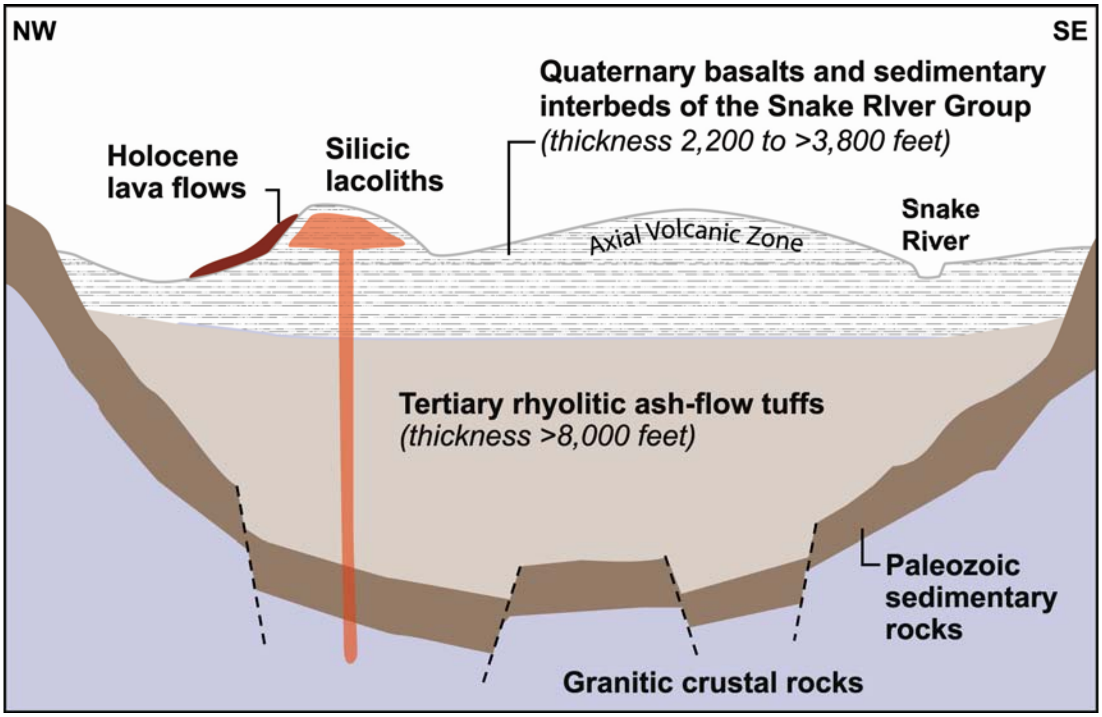

Figure 9-1. Conceptual model of the ESRP in the vicinity of the Atomic City site (9-079).

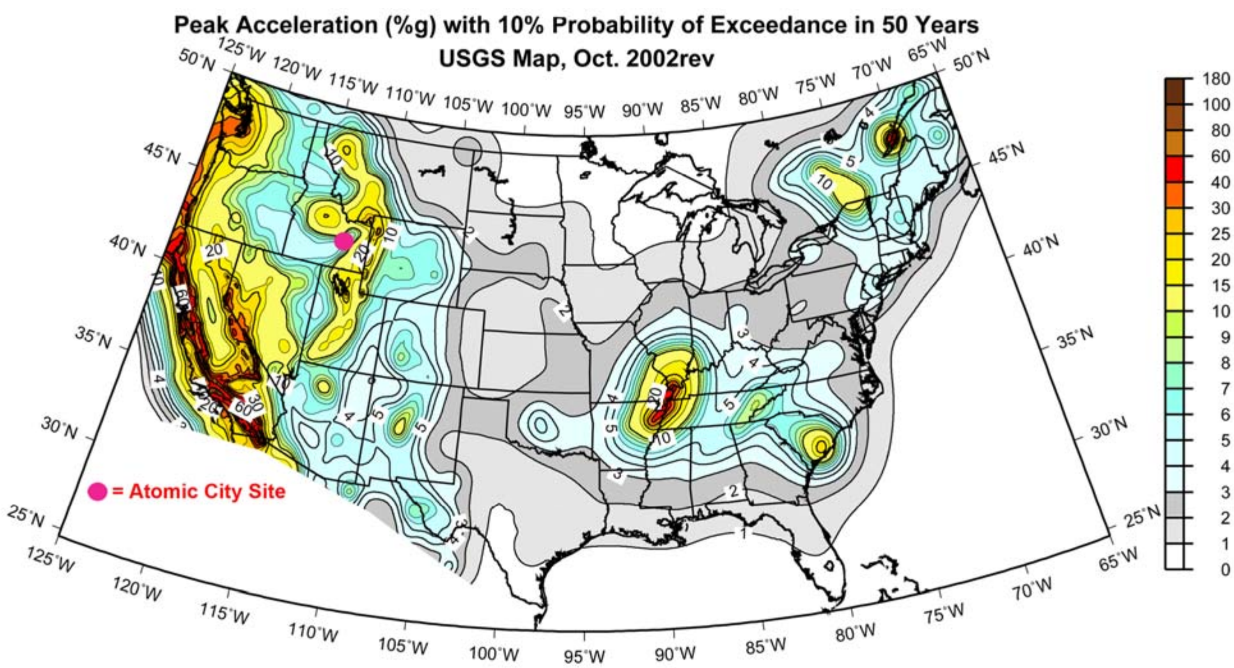

Figure 9-2. Seismicity in the region of the Atomic City site relative to continental seismicity (9-101, 9-102, 9-108).

9.2 Geologic Setting

This section describes the geologic setting of the Atomic City site, including geologic history, tectonics and structure, regional and local stratigraphy, and potential economic deposits.

9.2.1 Geologic History

The Atomic City site is located on the west-central part of the ESRP basalt province, a northeast-trending structural and topographic basin about 200 miles long and 50 to 70 miles wide. As early as the middle Tertiary Period (Miocene Epoch), great volcanic eruptions occurred in the area now occupied by the ESRP and in the bordering mountains. A considerable thickness of rhyolitic tuff, welded tuff, and agglomerate accumulated during this time. Regionally, inland lakes were impounded at a time concurrent with and following the later stage of Miocene volcanism. Thus, the Pliocene Epoch is well represented by thick accumulations of fluvial (stream) and lacustrine (lake) sedimentary deposits (9-033).

This early episode of Tertiary silicic and basic volcanism and lacustrine and fluvial sedimentation was followed by a period of very active basaltic volcanism over the entire ESRP. During the Quaternary Period (Pleistocene to Holocene epochs) that began about 1.6 million years ago (Ma), magma flowed from numerous local volcanic throat vents, fissures, and Hawaiian-type volcanoes throughout the area, forming a veneer over the much thicker rhyolite tuffs. Eruptions generally were nonexplosive, but locally (e.g., Craters of the Moon) the eruptions were explosive enough at times to produce pyroclastic rocks. Numerous basalt flows form the basaltic mass of the Snake River Group, a complex sequence of interlocking flows and pyroclastics, intercalated with thin beds of fluvial, lacustrine, and eolian (windblown) sediments. During numerous quiescent (nonvolcanic) periods lasting thousands to hundreds of thousands of years, these sediments were locally deposited atop the basalt on the surface at the time. All types of materials—flow sheets, pyroclastic sediments, windblown and water laid sediments, as well as cones, craters, and fissures—were buried by later flows; thus, these volcanic sequences are extremely heterogeneous in nature (9-033).

Volcanism continued into the Holocene Epoch (recent) depositing basaltic lava fields over parts of the ESRP. Radiocarbon dating of charred wood from a Craters of the Moon basalt flow suggest the last eruption may have occurred a little more than 1,600 years ago (9-033). Flows adjacent to the Atomic City site are age-dated at 12,000 to 13,000 years (9-026).

9.2.2 Tectonics and Structure

This section describes tectonic and structural features, including an overview of regional tectonic provinces. Regional tectonic provinces within a 200-mile radius of the Atomic City site include the ESRP, Basin-and-Range mountains and valleys north and south of the ESRP, the Yellowstone Plateau, the Rocky Mountains of Montana and western Wyoming, the Owyhee Plateau, the western Snake River Plain (WSRP), and the Idaho Batholith and Challis volcanic field of the central Idaho highlands. Figure 9-3 shows the location of these features.

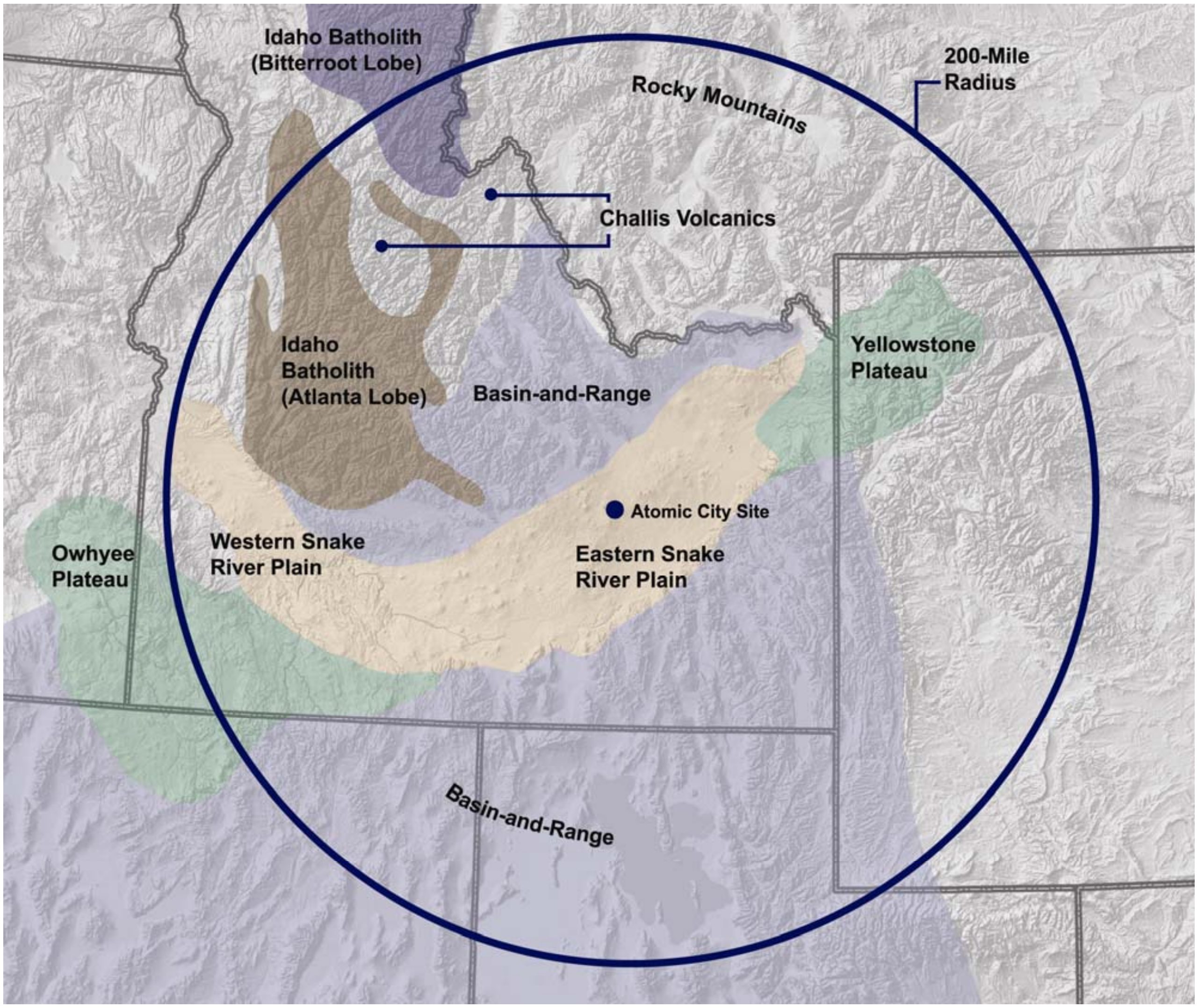

Figure 9-3. Regional tectonic provinces within 200 miles of the Atomic City site (9-025, 9-112).

9.2.2.1 Eastern Snake River Plain

The ESRP, the dominant geomorphic feature of southern Idaho, is a northeast-trending structural basin filled with topographically subdued, late-Tertiary and Quaternary volcanic rocks (i.e., basaltic lava flows, shield volcanoes, and rhyolitic domes). The plain is bounded by the elevated volcanic highlands of the Owyhee Plateau at its southwest terminus, the Yellowstone Plateau at its northeast terminus, and mountains and valleys of the Basin-and-Range Province to the northwest and southeast (9-025). Numerous basaltic lava fields form a commingled volcanic sequence with intercalated sediment in the upper 5,000 feet of the stratigraphic sequence. Less common are compositionally complex eruptive centers comprised of pyroclastic cones, dikes, and chemically evolved lavas (9-008).

The origin of the ESRP is currently believed to be related to the movement of the North American Plate in a southwesterly direction over the Yellowstone hot spot, a stationary rising plume of hot mantle material. As the plate passed over the hot spot beginning approximately 16 Ma during the mid-Tertiary

Miocene Epoch, the crust was heated and uplifted, and voluminous volcanism erupted thick sequences of rhyolitic ash flows and tuffs. Passage of the continental plate over the hot spot and caldera collapse caused subsidence of the ESRP beginning about 4 Ma, due to the cumulative effects of increased loads of dense, magmatic rocks emplaced in the middle of the crust, crustal extension, contraction of cooling crustal rocks, and isostatic adjustment. The time-progressive line of these calderas stretches from the oldest (15 Ma) McDermitt Caldera complex in northeast Nevada to the youngest (0.6 Ma) currently quiescent caldera at Yellowstone National Park. The Atomic City site is located within a region of inferred calderas approximately 6 to 6.5 Ma (9-025).

Throughout its geologic history, the ESRP has undergone tectonic extension parallel to extension of the Basin-and-Range regions to the northwest and southeast. No known boundary faults parallel the long axis of the plain, suggesting that the ESRP is not the downfaulted block of a graben subsequently covered by volcanics. Tectonic extension on the ESRP is believed to be accommodated more by dike injection than faulting, in contrast to extensional accommodation by normal faulting within the Basin-and-Range Province (9-008). Indeed, no faults associated with tension cracks and eruptive fissures have been identified within the late Pleistocene-Holocene lava fields. Dike-induced faults associated with the late Pleistocene-Holocene lava fields in the ESRP, if present, are extremely rare (9-091).

The ESRP is bounded on the northwest by Basin-and-Range block-faulted mountains and valleys, including the Lost River, Lemhi, and Beaverhead mountain ranges. The range-front normal faults of these systems display geomorphic evidence of Quaternary activity and, although the range-front faults project southeastward toward the ESRP, no tectonic faults are known to extend onto the plain (9-027).

Figure 9-4 shows structural and geologic features of the west-central part of the ESRP and adjoining Basin-and-Range valleys and mountains. These features include the northeast-trending AVZ, northwest-trending volcanic rift zones, the Big Lost Trough (BLT), silicic buttes, and Holocene lava fields.

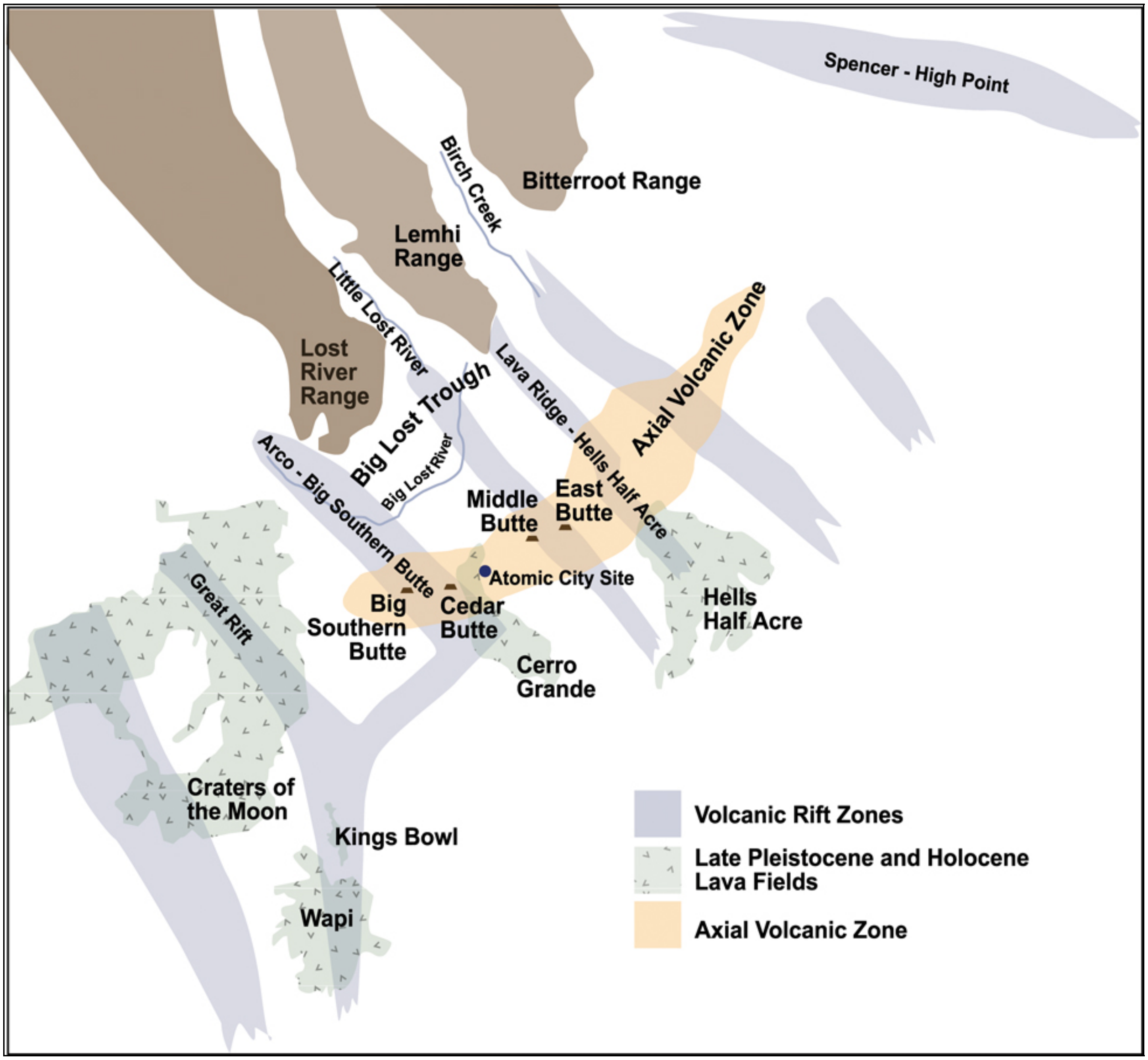

Figure 9-4. Eastern Snake River Plain and environs (9-090, 9-091).

Axial Volcanic Zone

The AVZ consists of a thick section of basalt flows that extends northeast along the long axis of the ESRP. Domes, shields, and complex eruptive centers are concentrated within this feature. The AVZ is topographically high (current and paleotopography) and divides the rivers and streams of the valleys to the northwest (e.g., Big Lost River and Little Lost River) from those to the southeast (e.g., Snake River). The waterways immediately to the south are tributaries of the Snake River, whose waters eventually reach the Pacific Ocean. The waterways to the north of the AVZ, however, terminate in playas and sinks because they are prevented by the topographically elevated AVZ from crossing the ESRP and reaching the Snake River (9-025). As shown in Figure 9-4, the Atomic City site is in the south-central portion of the AVZ.

Volcanic Rift Zones

Researchers believe that tectonic extension of the ESRP has been partially accommodated by intrusion of magma, primarily within volcanic rift zones containing concentrated volcanic vents and fissures. Volcanic rift zones in the ESRP, from north to south, include the Spencer-High Point volcanic rift, Lava Ridge-Hell's Half Acre volcanic rift, Arco volcanic rift, and the Great Rift. Volcanic rift zones are oriented northwest-southeast, perpendicular or sub-perpendicular to the long axis of the ESRP and AVZ. Some of the rift zones align with known extensional faults and include the Arco volcanic rift (aligned with the Lost River Fault), the Lava Ridge-Hell's Half Acre volcanic rift (aligned with the Lemhi Fault), and the Spencer-High Point volcanic rift (aligned with the Middle Creek Butte Fault). Other volcanic rift zones apparently are not associated with known faults, particularly the Great Rift Zone (9-025). As shown in Figure 9-4, the Atomic City site lies just north of the Arco volcanic rift.

Big Lost Trough

In contrast to the raised topography of the AVZ and volcanic rift zones, the floodplain of the Big Lost River and the sinks of the Big Lost and Little Lost rivers are contained in a low-relief area known as the BLT. This feature is surrounded by higher elevation features: the AVZ to the south and southeast, the shield volcanoes of the Arco rift to the southwest, and the Big Lost, Lemhi, and Beaverhead mountain ranges to the west and northwest. Fluvial sedimentary interbeds in this area consist of coarse-grained sands and sandy gravel representing channel and terrace deposits, and fine-grained silts and silty clays laid down as overbank deposits (9-023). The pattern of drainage and deposition in the BLT exists because of the AVZ. The Big Lost River, the Little Lost River, and Birch Creek would flow directly to the Snake River to the east if not for the topographic high of the AVZ. Based on stratigraphic correlation and age-dating, it appears that the BLT and AVZ (and associated depositional patterns) date from at least 1.77 Ma (9-025).

Silicic Buttes

Topographically and petrologically distinctive Quaternary high-silica rhyolite domes, plug-like cryptodomes, and laccoliths intrude the ESRP basalts. These silicic features are located on the AVZ and include, from northeast to southwest, East Butte, Middle Butte, Cedar Butte, and Big Southern Butte. Similar Quaternary rhyolite domes occur 80 miles to the southeast in the middle of the Blackfoot volcanic field, and may also form the cores of laccoliths (i.e. Ferry Butte, Blackfoot Dome) along the southern margin of the ESRP near Blackfoot, Idaho. Taken together, these rocks define a broad southeast-trending zone of widely distributed rhyolite volcanoes and hypabyssal intrusions, extending from the center of the ESRP across the southern margin of the plain and into the middle of the Blackfoot volcanic field (9-080). As shown in Figure 9-4, the Atomic City site lies between Big Southern Butte to the southwest, and Middle Butte and East Butte to the northeast.

Holocene Lava Fields

As discussed in Section 9.2.1, volcanism continued into the Holocene, depositing local basalt flows across the ESRP. These flows, from north to south, include Hells Half Acre, Cerro Grande, Craters of the Moon, Kings Bowl, and the Wapi (9-025). Basalt flows nearest to the Atomic City site are the Cerro Grande, North Robbers, and South Robbers flows, age-dated at 12,000 to 13,000 years (9-026).

The site selection process for the New Production Reactor site at the INL identified volcanic hazards as a criterion for selection (9-055). A study completed in 1994 identified the location of volcanic vents, eruption recurrence intervals, and volcanic hazard zones at the INL (9-074). Substantial characterization and mapping of volcanic features has since been conducted and further analysis of volcanic hazards would be required for any facility on or near the INL.

9.2.2.2 Basin-and-Range

The Basin-and-Range tectonic and physiographic province is an immense region centered on the state of Nevada and extending from southern Oregon to western Texas. The province was initiated about 20 Ma and continues today as the crust spreads apart (extensional deformation), creating a pattern of parallel north-south faults along which surface rocks slide, forming an alternating series of mountain ranges and valleys or basins. About 400 mountain blocks were formed this way, and they have rotated slightly from their originally horizontal positions. These mountains of late Precambrian and Paleozoic rock continue to erode and fill the intervening valleys with fresh sediment (9-114). The total amount of lateral extension in the area of southeast Idaho over the last 16 million years is as much as 40 miles, at rates of 3.7 to 5.0 inches per year.

The Lemhi and Big Lost mountain ranges northwest of the site are examples of this high-angle normal faulting (i.e., hanging wall down-dropped in relation to footwall). These ranges are over 60 miles long, 12 to 19 miles wide, and separated by long, narrow basins about 12 miles wide. Each of these ranges is bounded on the southwest side by a normal fault, along which episodic faulting allows the basin to subside and the mountain range to move upward in response to the persistent extension of the region. The Lost River and the Lemhi faults are the closest major faults, about 30 miles to the northwest of the Atomic City site (9-025). The only other significant Basin-and-Range fault within 50 miles of the Atomic City site is the Beaverhead fault further north along the Idaho-Montana border (9-095).

A normal fault that produces a major earthquake like that at Borah Peak, with offset of 6 feet every 2,000 years (a net movement rate of 0.04 inches per year), will produce 15,000 feet of offset in 5 million years. Such rates appear reasonable based on geologic and paleoseismic data (9-114).

9.2.2.3 Yellowstone Plateau

The Yellowstone Plateau covers an area of about 2,500 square miles and forms the continental divide between the northern and middle Rocky Mountains, although the plateau itself conventionally is considered to be part of the middle Rockies. Most of the plateau lies within Yellowstone National Park; however, it once extended farther onto the Snake River Plain and its margins, as well as outward from the national park along the valleys of the Madison, Gallatin, and Yellowstone rivers, most of the way across Jackson Hole, and across parts of the western Absaroka Range. The original extent of the volcanic field now represented by the Yellowstone Plateau was nearly 6,550 square miles (9-089).

The rhyolite plateau of Yellowstone National Park and nearby areas consists predominantly of rhyolites with lesser amounts of basalt. Volcanism began just before 2 Ma with eruption of numerous lava flows and welded ash-flow tuff, followed by caldera collapse. Although the highly active hydrothermal system of Yellowstone National Park and numerous, small seismic events are the only current manifestations, volcanism probably has not yet ended (9-089, 9-037, 9-109).

The Yellowstone Plateau is in a region of active tectonic extension. Late Miocene and younger normal-fault blocks have mainly north-to-northwest trends. The principal belt of seismic and tectonic activity along the east margin of the active region passes directly through the Yellowstone Plateau volcanic field. Differential uplift and tilting of fault blocks has accompanied volcanism, and the principal volcanic structures were controlled by tectonic structures. The field lies on a northeastward extension of the AVZ, the ESRP volcanic and tectonic axis (9-089).

9.2.2.4 Rocky Mountains

The Rocky Mountains of south-central Montana (Northern Rockies) and western Wyoming (Middle Rockies) are glaciated mountains with limestone scarps and ridges interspersed with glacial and lacustrine intermontane basins. The Rocky Mountains of central Wyoming belong to the stable North American craton, whose metamorphic and igneous rock foundations crystallized in Archean time more than 2,500 Ma. The topography of this area is controlled by mountain structures made in the Laramide orogeny, 70 to 50 Ma. Generally, the Laramide orogeny consisted of large uplifts of Archean rocks of the Wyoming province, which punched upward through their thin Paleozoic and Mesozoic sedimentary cover. Examples include the Wind River Range, Owl Creek Mountains, Ancestral Teton Range, and Gros Ventre Range. In between the Laramide uplifts, basins subsided, including the Green River and Wind River Basins (9-114).

The Idaho-Wyoming Thrust Belt is a significant field of low-angle reverse faults, located mostly in the western Wyoming Rocky Mountains. It is just one segment of the Cordilleran thrust belt that contains folded and thrusted sedimentary rocks along the North American Cordillera, from Alaska south to Mexico. The area is underlain by a thick succession of sedimentary rocks that was deposited off the subsiding edge of North America in Proterozoic, Paleozoic, and Mesozoic time. The subduction of the eastward-moving Pacific Plate caused the formation of numerous magmatic plutons of the Idaho Batholith and the Sierra Nevadas. Thrusting occurred in response to associated crustal thickening caused by pluton emplacement of the plutons; continental sheets were compressed, folded, and thrust as much as 100 miles eastward toward the continent during the Sevier orogeny, about 130 to 55 Ma in late Mesozoic and early Tertiary time. This period of compressional tectonics was followed by extensional normal faulting of the Basin-and-Range within the Overthrust Belt (9-092, 9-114).

9.2.2.5 Owyhee Plateau

The Owyhee Plateau is a complex subprovince of the northwestern U.S. flood basalt province, located at the intersection of the WSRP, Oregon Plateau, Basin-and-Range, Northern Nevada Rift, and Oregon-Idaho Graben. Basaltic volcanism on the Owyhee Plateau initiated concurrently with the main pulses of the Columbia River and Steens basalts, approximately 17 Ma, with the eruption of strongly differentiated basalts to basaltic andesites (9-097). Beginning about 11 Ma, small volumes of less fractionated olivine tholeiitic basalts were erupted from discrete vents throughout the area. These younger basalts are focused along linear fractures and associated with numerous shield volcanoes and cinder cones concentrated primarily within the plateau confines. The oldest manifestations of this activity are small shield volcanoes that formed and erupted about 10 Ma, along northwest-trending fault zones (9-088).

The plateau today is characterized by a relative lack of large-displacement normal faults, dissimilar to surrounding regions where extension was occurring prior to and concurrent with flood basalt volcanism. Furthermore, there is no geologic evidence present within the Owyhee Plateau to suggest the presence of large, mid-Miocene and younger extensional structures like those that exist adjacent to the plateau. While this obvious lack of large scale faulting on the Owyhee Plateau may be accommodated partially by dike injection concurrent with extension, rift-related sedimentation and volcanism both appear to be absent (9-088).

9.2.2.6 Western Snake River Plain

The WSRP is a topographic basin that trends northwest from south-central Idaho to the Idaho-Oregon border. Though geographically adjacent to, and lying at a high angle to the ESRP, it differs significantly in lithology and structure. The WSRP is a normal, fault-bounded basin with both the land surface and rock layers dipping towards the axis of the plain. The basin is filled by interbedded volcanic rocks and lake bed sediments of Tertiary and Quaternary age. The rocks which occupy the WSRP are the Idavada Volcanics, which contain rhyolitic tuffs and ash flows 15 to 11 Ma, and the Idaho Group, which is composed of fluvial and lacustrine sediments with interbedded basalt flows deposited in a subsiding basin (9-112).

The WSRP is a graben with distinct high-angle normal fault zones along its margins, with postulated aggregate vertical displacement of at least 9,000 feet. Most faults are downthrown toward the axis of the WSRP, resulting in its grabenlike structure (9-002). Unlike the ESRP, it is not parallel to North American Plate motion.

9.2.2.7 Idaho Batholith

The Idaho Batholith is a composite mass of granitic plutons covering approximately 15,400 square miles in central Idaho. The area contains alpine ridges and cirques at higher elevations with large, U-shaped valleys with broad bottoms, indicating strong alpine glaciation. Elevation ranges from 3,000 to 10,000 feet and local relief ranges from 3,000 to 5,000 feet (9-112).

The Idaho Batholith contains a composite mass of Cretaceous intrusive rocks, mostly granite and granodiorite. The batholith occurs in two separate lobes representing different stages of magmatism. The Atlanta Lobe, closest to the Atomic City site, represents the older of two stages and was intruded 105 to 75 Ma. The Bitterroot Lobe to the north was intruded 85 to 65 Ma. The granites of the batholith were formed in a compressional regime during Late Cretaceous time as the oceanic Farallon Plate was subducting underneath the North American Plate (9-114).

9.2.2.8 Challis Volcanic Field

The Challis volcanic field in central Idaho is the largest of several Eocene volcanic fields in the Pacific Northwest. Surrounding mountain ranges include White Cloud Peaks, Pioneer Mountains, Smokey Mountains, Boulder Mountains, White Knob Mountains, and portions of the Salmon River Range. Challis volcanics erupted from 51 to 40 Ma in a sequence of early andesite-dacite flows, followed by explosive dacite-rhyolite ash-flow tuff eruptions and formation of cauldron complexes, culminating in intrusion of late-stage dacite-rhyolite domes and plugs. Miocene Idavada Volcanics rhyolite ash-flow tuffs were deposited unconformably on the Challis Volcanics (9-096).

The paleotopographic basin in which the Challis Volcanics accumulated was in part structurally controlled by preexisting west- and northwest-trending normal faults. Eocene extension and/or Basin-and-Range faulting and tilting deformed the rocks to their present generally east-dipping inclination. Northeast-trending lineaments are conspicuous and suggest a relationship to similarly oriented Eocene extension zones. The lineaments may be fracture zones related to incipient rifting (9-096).

9.2.3 Stratigraphy

This section presents regional and local stratigraphy, derived primarily from boreholes and wells on and around the INL. Within the context of this report, regional stratigraphy can be considered as including the ESRP, and local stratigraphy is the rock sequence directly underlying the Atomic City site.

9.2.3.1 Regional Stratigraphy

Generally, rocks beneath the ESRP consist of a complex sequence of layered basalt flows, cinders, and sediment that ranges in age from about 100,000 to 600,000 years. Flow groups consist of single or multiple flows that were formed during eruption events of less than 200 years duration. Basalt-flow groups unconformably overlie older flow groups or are separated from older flow groups by thin-to-thick layers of sediment. These layers are the result of sediment accumulations across the area during long intervals of volcanic inactivity ranging from thousands to hundreds of thousands of years. Major interbeds are as much as 40 feet thick and consist of well- to poorly-sorted deposits of clay, silt, sand, and gravel. In places, the interbeds contain cinders and basalt rubble (9-085).

Modern sediments are distributed on the ESRP largely in eolian, lacustrine (playa-like sinks) and fluvial depositional systems. Playa sediments are clay-rich silt and fines and mixtures of eolian and stream-born material. Fluvial sediments are mostly coarser sand, pebbles, and cobbles. North of the AVZ, they are derived from the Big Lost River, Little Lost River, and Birch Creek drainages with outlets on the INL. South of the AVZ, fluvial sediments are controlled by the Snake River and its tributaries, the Henrys Fork, Blackfoot, and Portneuf rivers. Loess and eolian sand also covers most pre-Holocene surfaces and occurs as layers between lava flow groups in the subsurface (9-008). The generalized regional stratigraphy, from oldest unit to youngest unit, is described in the following subsections (9-002).

Older Silicic Volcanic Rock

Tertiary silicic volcanic rocks (primarily represented by the Idavada Volcanics of the Idaho Group) are exposed at places in Snake River canyon walls but rarely in outcrops. These are rhyolitic to andesitic ash-flow tuffs and may be associated with buried calderas.

Older Basalt

These Tertiary rocks include flood-type basalts equivalent in age to the Columbia River Basalt Group of Oregon and Washington. They are rare to absent in the ESRP.

Older Alluvium

These deposits, consisting of clay, silt, sand, and gravel, are less than 10 feet thick or absent throughout most of the ESRP. They contain Pleistocene sands or gravels derived from bordering mountains and extending into the ESRP for several miles. This older alluvium may be intercalated with basalt near the margins of the plain.

Younger Silicic Volcanic Rock

These ash-flow tuffs are present in the extreme northeastern part of the ESRP and may underlie Quaternary basalt elsewhere in the plain. The tuffs, which are similar to rocks of the Idavada Volcanics, are related to Quaternary volcanism on the Yellowstone Plateau. Where fractured, the tuff has high porosity. Thick, nonwelded ash beds with sandy texture are also present.

Younger Basalt

Quaternary olivine tholeiitic basalt of the Snake River Group is the most areally extensive rock unit in the ESRP and is generally found within 10 feet of land surface, or in outcrops. This material is derived primarily from well-developed to diffuse systems of vents and fissures. The basalt is thickest in the central part of the ESRP and typically thins toward the edges. Basalts of the Snake River Group reach thicknesses of 2,200 to 3,800 feet in the central portion of the ESRP (9-086) and may reach 5,000 feet thick in troughs (9-002). Most of the flows are in layers only a few feet thick and occupy areas of a few tens to hundreds of square miles. A typical basalt flow of this type consists of three sections. The top layer is usually less than 6 feet thick and consists of fine-grained, vertically and horizontally jointed vesicular basalt. The middle section, about 15 to 25 feet thick (though may be much less), is coarse-grained, massive, and contains vertical columnar joints and pipes. A basal layer, usually less than 3 feet thick, consists of fine-grained to scoriaceous blocks of oxidized basalt, though oxidation may not be present in all flows (9-002).

Windblown Deposits

Quaternary windblown deposits (eolian) mantle the basalt in much of the ESRP and mask geologic contacts and structural features. Where thick enough to plow and of sufficient areal extent, soils formed from eolian deposits are agriculturally productive. Elsewhere, these deposits may form sand dunes on the surface.

Younger Alluvium

Quaternary alluvium is present along most stream channels and commonly consists of sand, gravel, and minor amounts of clay.

9.2.3.2 Local Stratigraphy

Local stratigraphy beneath the site to approximately 700 feet below land surface (bls) is derived from studies of surficial deposits, as well as natural gamma geophysical logs for boreholes USGS-1 (total depth 636 feet bls) and USGS-110 (total depth 780 feet bls). Below 700 feet bls, stratigraphy is based on information from INEL-1, a 10,325-foot deep test well drilled on the INL. Borehole locations are shown in Figure 9-5. The geophysical logs for USGS-1 and USGS-110 are shown in Figure 9-6, and the generalized lithologic log for INEL-1 is shown in Figure 9-7.

Natural gamma geophysical logs are useful for delineating sediments because sedimentary material has a greater concentration of naturally occurring radioistopes than basalts and exhibits a positive deflection on the log.

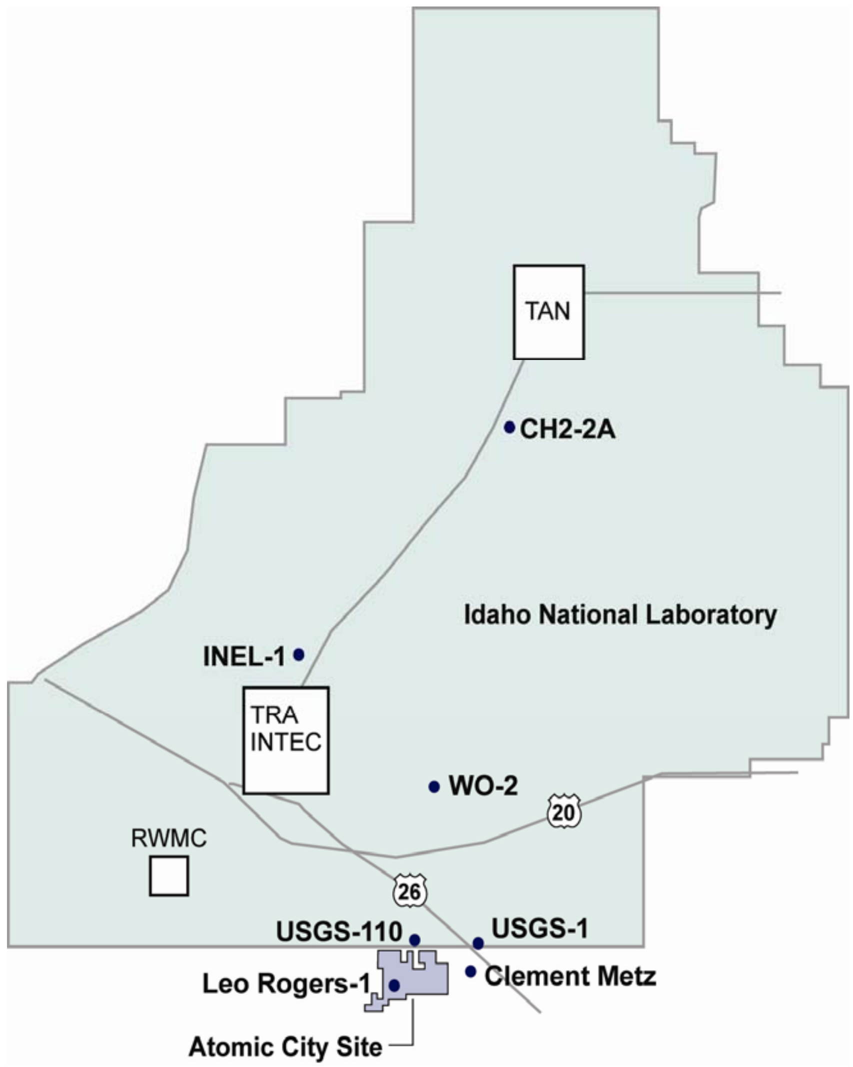

Figure 9-5. Location of boreholes used to assess local stratigraphy (9-029, 9-069, 9-119).

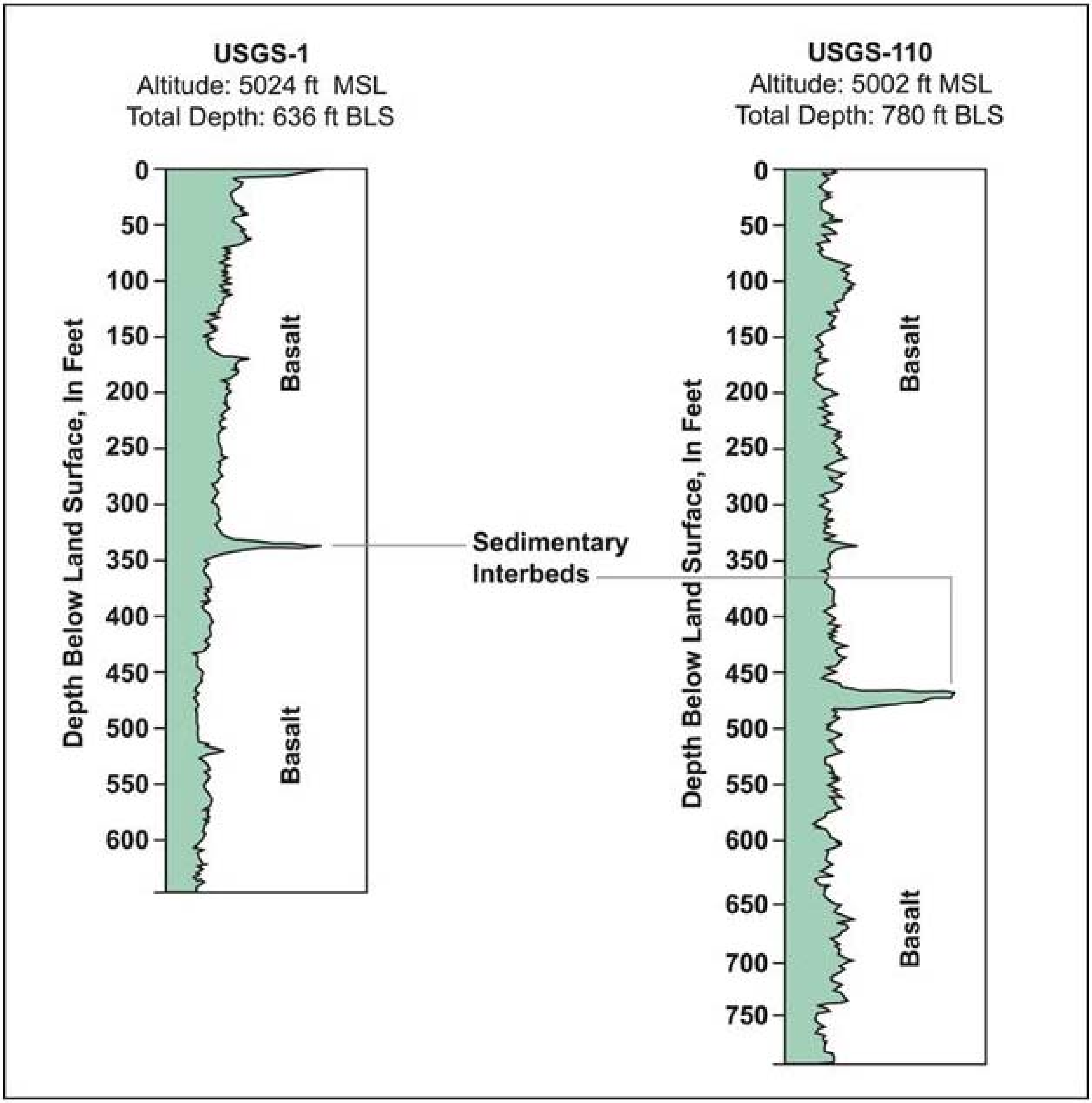

Figure 9-6. Natural gamma geophysical logs for boreholes USGS-1 and USGS-110 (9-029).

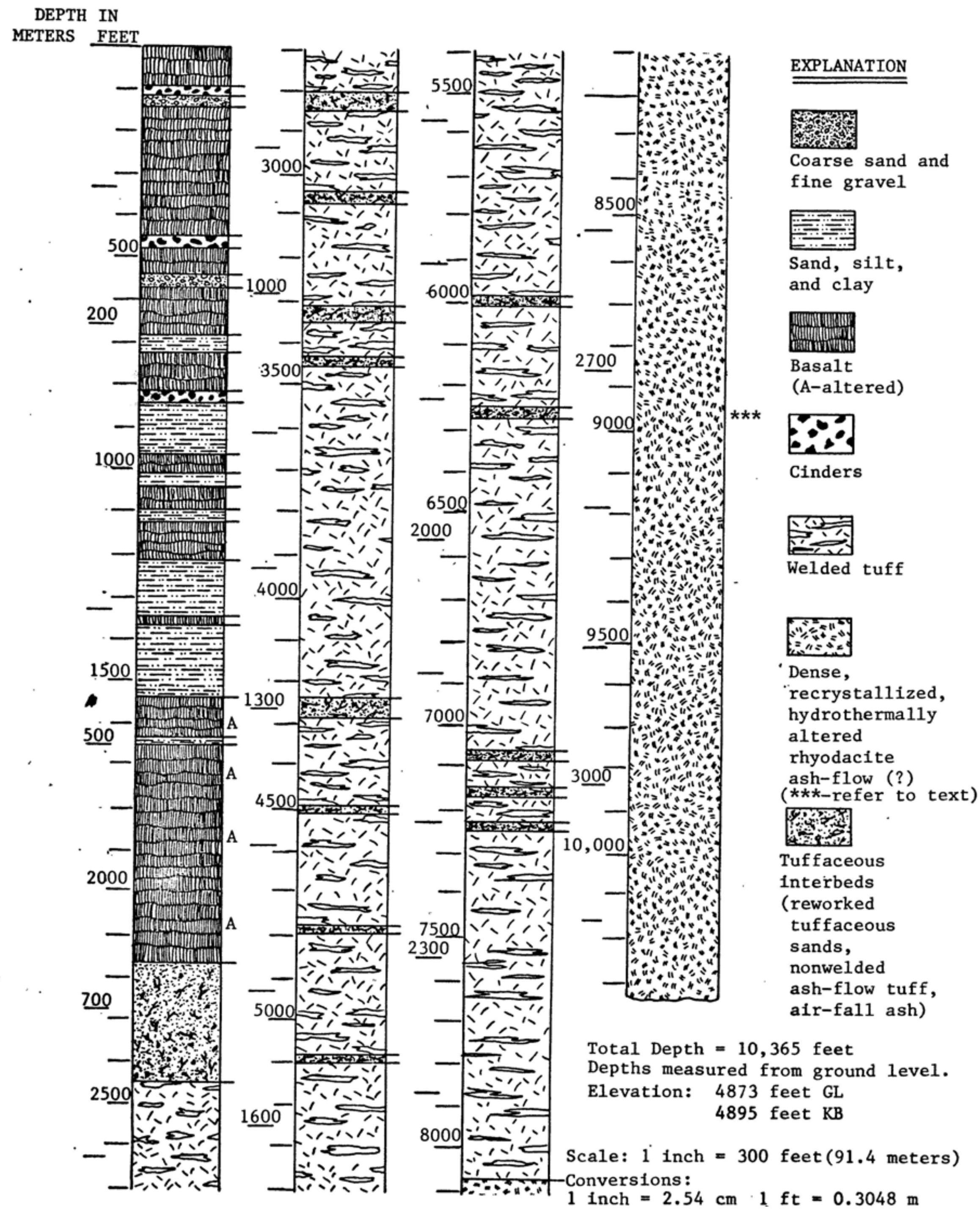

Figure 9-7. Generalized lithologic log of borehole INEL-1 (9-028).

The surface of the Atomic City site is mostly covered with surficial sediment. Generally, bedrock of Snake River Group basalts is found within 10 feet of the land surface (9-002). Locally, the thickness of the surficial sediment varies; e.g., 0 feet thick at outcrop locations, 3 feet thick at the Leo Rogers-1 well (9-030), and 17 feet thick at the Clement Metz well (9-119) (well locations shown on Figure 9-5). This surficial material consists of a veneer of unconsolidated wind-blown clay and silt, generally accumulated during the last 200,000 years (9-030). As described in Section 9.2.3.1, Quaternary alluvium may be present along stream channels within the site boundary and commonly consists of sand, gravel, and minor amounts of clay.

Beneath the surficial sediment, basalts of the Snake River Group are intercalated with thin interbeds of sedimentary material. Natural gamma geophysical logs for USGS-1 and USGS-110 (Figure 9-6) show basalt to total depth in each hole with few sedimentary interbeds. Specifically, the log for USGS-1 indicates a 15-foot thick sedimentary interbed at about 325 feet bls and the log for USGS-110 shows a 25-foot thick sedimentary interbed at approximately 450 feet bls (9-029). In 2004, the water level was measured at 594 feet bls in USGS-1 and at 571 feet bls in USGS-110 (9-113). Much of the Atomic City site is topographically higher than USGS-1 so a generalized water level of about 600 feet bls is a reasonable estimate for the water table directly underlying the site. See Section 3, *Water Resources,* for more detailed description of ground water at the site.

This upper stratigraphy of the Atomic City site is generally consistent with the stratigraphy of INEL-1, except that INEL-1 contains several more interbeds of cinders, sand, and gravel. This difference is likely attributed to the site location on the topographically high AVZ and its distance from the BLT and the recent and paleofloodplains of the Big Lost and Little Lost rivers. Generally speaking, eolian deposits are less likely to accumulate at higher (exposed) elevations. Streams seek lower ground; fluvial deposits are also less common at higher elevations. Correlation of basalts and sedimentary interbeds between boreholes on the INL show that interbeds become less numerous and decrease in thickness away from the channel of the BLT (9-025).

Below 700 feet bls, site stratigraphy is interpolated from INEL-1. In that deep borehole, Snake River Group basalts, interbedded with cinders, silt, sand, and tuffaceous silt, were penetrated to a depth of 2,445 feet bls. The basalts were mostly fresh olivine basalts typical of ESRP tholeiitic basalts. Below 1,600 feet, propylitic alteration (i.e., hydrothermal alteration with development of calcite, chlorite, and/or epidote) and secondary zeolite mineralization is common. This alteration is most intense from depths of 2,000 to 2,160 feet. Directly underlying these basalts is a 275-foot thick section of slightly altered, tuffaceous silt and silty clay from 2,445 to 2,720 feet bls (9-028).

Rhyolitic ash-flow tuffs, mostly dense and devitrified, occur in the interval from 2,720 to 8,070 feet bls. In this section, individual ash-flows are typically separated by 10 to 100 feet of altered vitroclastic air-fall ash, nonwelded ash-flow tuffs, or reworked tuffaceous sand. Several of the welded ash-flow tuff sheets are over 500 feet thick, and one sheet is nearly 1,100 feet thick. Hydrothermal alteration is most evident on fracture surfaces within the rhyolitic rocks. Nearly all fractures are sealed by propylitic alteration productions and a variety of clay minerals (9-028).

From 8,070 to total depth (10,365 feet bls) is a dense, hydrothermally altered, recrystallized, aphanitic rhyodacite porphyry. Petrographic evidence suggests that the rhyodacite may be a thick ash-flow tuff. Another possibility is that the rhyodacite represents a high-level intrusive rock, possibly the source for the hydrothermal alteration and mineralization found in the overlying rock (9-028).

9.2.4 Occurrence of Groundwater

The occurrence of groundwater and description of the underlying Snake River Plain Aquifer is presented in Section 3, *Water Resources*, and Section 11, *Hydrology/Flooding*.

9.2.5 Economic Deposits

Idaho has produced significant metallic minerals such as gold, silver, lead, zinc, copper, and molybdenum. Important industrial minerals include garnet, phosphate, and sand and gravel. Another potential economic “deposit” includes locations of deep geothermal activity. Hydrocarbon reserves (e.g., petroleum, coal, natural gas) are not significant in Idaho.

9.2.5.1 Minerals

Hydrothermal alteration of Tertiary volcanic rocks of the Owyhee Plateau (Silver City mining district) historically produced economic quantities of gold and silver. Though Tertiary volcanics underlie the Atomic City site, there are no current hard rock mineral mines in Bingham County as of 1995 (9-098).

The Silver Valley or Coeur d’Alene District in the Idaho Panhandle has produced significant tonnages of silver, gold, lead, zinc, and copper from deep, high grade veins since the district was discovered in the 1880s. The metals are found in 1.4 billion year-old Precambrian rocks of the Belt Basin which are weakly metamorphosed argillite, siltstone, and quartzite (9-032). Rocks of this type are not found in the region of the Atomic City site.

The Phosphate Mining District, located in the southeast portion of the state near Soda Springs produces significant amounts of phosphate from four open-pit mines. The phosphate is found as apatite from the Permian-aged Phosphoria Formation, formed 260 Ma in a large marine basin (9-032). This formation is not found in the vicinity of the Atomic City site.

9.2.5.2 Geothermal Deposits

The geothermal resource of southern Idaho as assessed by the USGS in 1978 is large. Areas that appear particularly promising for the occurrence of large high-temperature hydrothermal systems are the area north of the Snake River Plain and west of the Idaho Batholith, the Island Park area, segments of the margins of the ESRP, and the Blackfoot lava field (9-034).

Although the geology of the ESRP suggests that a large thermal anomaly may underlie this area of the plain, direct evidence of high temperatures has not been found. However, a large thermal gradient was encountered in INEL-1, a 10,365-foot test hole drilled at the INL. For instance, water temperature at 600 feet bls was measured at 26°C (79°F) and at 9,985 feet bls, was measured at 146°C (295°F). Other deep holes drilled on the INL show similar gradients of approximately 1.3°C (2.3°F) per hundred feet of depth (9-014).

9.2.5.3 Hydrocarbons

To date, hydrocarbon resources have not been developed in Idaho. Principal areas of oil and gas exploration include the eastern margin of the Columbia River Plateau, the WSRP, Lemhi Range/Beaverhead Mountains, the southeast Idaho thrust belt complex, and the Cassia Mountains. Of these, the southeast Idaho thrust belt complex is closest to the Atomic City site, and is also considered to be the most promising (9-035).

Three major thrust faults are evident at the surface and include the Paris, Meade, and Absaroka. The surface expression of each fault is thought to mark the boundary of a major thrust plate or sheet. Exploration has targeted buried or surface structures, such as anticlines and faults, within and beneath these sheets. In nearby fields in Wyoming and Utah, thrust belts yield prolific oil and gas from rocks ranging in age from Ordovician through Cretaceous. The closest producing area to Idaho is the now abandoned one-well Hogback Ridge field, about 10 miles from the Idaho border in Rich County, Utah. This well produced gas for about three years from Permian and Triassic formations (9-035).

9.3 Seismic Characteristics

This section describes the potential for vibratory ground motion (Section 9.3.1) and surface faulting (Section 9.3.2) at the Atomic City site. The approach to the studies is based on the requirements outlined in 10 CFR 100 Appendix A (9-120), and may be used to develop seismic and geologic design bases for application to engineering design.

9.3.1 Vibratory Ground Motion

Vibratory ground motion is a required investigation per 10 CFR 100 Appendix A Section (a) (9-120). The investigation will support subsequent determination of the Design Basis for Vibratory Ground Motion.

9.3.1.1 Geologic Setting

The lithologic, stratigraphic, and structural geologic conditions of the Atomic City site and surrounding region are presented in Section 9.2. The Atomic City site groundwater and surface water hydrology is presented in Section 3, *Water Resources*, and Section 11, *Hydrology/Flooding*.

9.3.1.2 Tectonic Structures

The tectonic framework of Idaho and surrounding states is highly complex, and a detailed review is beyond the scope of this report. Generally though, major tectonic structures within 200 miles of the Atomic City site include intruded dikes and lacoliths associated with ESRP volcanism, Basin-and-Range structures, and collapsed calderas.

Dikes and Lacoliths

Tension cracks and faults are tectonic structures associated with dike emplacement and fissure-dominated eruptions in the ESRP. Dike-induced tension cracks are recognized at several Pleistocene-Holocene lava fields (e.g., Craters of the Moon, Kings Bowl, Wapi, Hell’s Half Acre). Tension cracks exhibit evidence of purely extensional movement with no evidence of vertical or rotational movements. Dike-induced faults associated with the late Pleistocene-Holocene lava fields in ESRP, if present, are extremely rare. Numerous faults in the Arco-Big Southern volcanic rift zone near the margins of the ESRP are tectonic in origin and related to the Lost River range-front fault (9-091).

These fault-like structures have been identified as Idaho rift system faults and form a network of fractures, tensional fissures, fault-scarp-like features and monoclines that are all associated with the intrusion of shallow igneous dikes in the underlying crust. The fault-like structures do not extend to significant depths in the crust, probably 3 miles or less; therefore, they do not pose a serious seismic threat. The surface extension that produces these is related to the emplacement of shallow igneous dikes in the underlying crust. Thus, the formation of these fault-like features is directly associated with episodes of dike emplacement in the Snake River Plain. The northwest-southeast orientation of the intruding dikes and the associated fissures and scarps is related to the overall northeast-southwest extension direction in this part of eastern Idaho (9-077).

Basin-and-Range Structures

As discussed in Section 9.2.2.2, Basin-and-Range structures generally include subparallel fault-bounded mountains separated by broad alluvium-filled basins. The ranges have been uplifted relative to the valleys along range-front faults and related intrabasin faults. Figure 9-3 shows that most of the region within 200 miles of the Atomic City site, with the obvious exception of the ESRP, consists of Basin-and-Range mountain ranges and associated structures. Likewise, most of the major faults in the vicinity of the site (e.g., Lost River fault, Lemhi fault, Beaverhead fault, Grand Valley fault) are long range-front, high-angle, normal faults characteristic of Basin-and-Range faulting (9-095).

Collapsed Calderas

In the vicinity of the Yellowstone Plateau, numerous faults are loosely associated with the eruptions and subsequent collapses of calderas (i.e., Yellowstone caldera series, Island Park caldera). Most of these faults are related to volcanic or magmatic processes and are of questionable seismogenic origin. Specifically, faults along the Lava Creek caldera margin form a ring-like margin around the middle Quaternary Lava Creek caldera, formed about 630 thousand years ago (ka). Also included are several faults that represent collapse of the northwestern caldera margin. They are probably related largely to eruption and subsequent rapid collapse of the caldera about 630 ka (9-082). Similarly, unnamed faults of the Island Park caldera are curvilinear and short linear scarps probably related to volcanic collapse of the Island Park caldera (9-078).

9.3.1.3 Induced Seismicity

Previous studies of seismicity have shown that earthquakes can result from human activities such as mining, fluid injection or withdrawal, and crustal loading associated with filling and emptying of large reservoirs. There is no evidence in the current literature that any of these phenomena have contributed to significant seismicity in the Atomic City site area.

9.3.1.4 Physical Evidence of Subsurface Material Behavior during Prior Earthquakes

A thorough search of site literature found no evidence that prior earthquakes caused noticeable surface expressions such as surface faulting or fissuring, fault scarps, offsets, soil liquefaction, sand spouts, gravity sliding, slumping, subsidence, sags, slope failure, churned ground, or sinkholes at the Atomic City site.

The closest earthquake to the site was Borah Peak at 68 miles. Ground accelerations from this earthquake were observed by the INL seismic monitoring network; PGA ranged from 0.022g to 0.078g for free field accelerographs and accelerographs located in basements (9-107).

The INL seismic website states the following:

> Investigators since the late 1960s recognized that ESRP subsurface conditions seem to dampen seismic waves. Subsurface characterization, modeling, and earthquake monitoring studies were conducted to understand the manner in which seismic waves are affected by the ESRP basalt layers. The alternating sequence of basalt and sediment interbeds that comprise the ESRP subsurface dissipate (or attenuate) seismic energy to a greater extent than uniform basalt rock. The passage of seismic waves through alternating layers of hard basalt and loosely consolidated (soft) sediments scatter and dampen seismic energy, resulting in earthquake ground motions which are 15 to 25 percent lower than they would be for uniform basalt rock. In 1997, an independent scientific review panel convened by the State of Idaho concluded: Sedimentary interbeds within the basalt are highly effective at damping earthquake ground motions, and the geometry of sedimentary interbeds do not cause focusing or amplification of ground motions (9-019).

9.3.1.5 Engineering Properties of Subsurface Materials

Three sources of publicly available information were found that could be considered representative of the subsurface lithology at the Atomic City site. Geophysical logging information from two deep boreholes, INEL-1 and CH2-2A (located on the INL as shown in Figure 9-5), provide the best available information on the deep basaltic and silicic volcanic rock units believed to underlay the Atomic City site (9-118). Geophysical surveys and rock core analysis conducted as part of the DOE New Production Reactor program in the early 1990s produced rock property data for the shallow basalt units and sedimentary interbeds (9-063, 9-064, 9-065, 9-069). Geosciences personnel at the INL, in cooperation with USGS and academic institutions, have performed extensive studies beginning in the late 1980s to assess groundwater movement in the vadose zone. These studies have produced basic rock property information for surficial soils, shallow basalt units and sedimentary interbeds (9-083, 9-087, 9-093, 9-117). Relevant information from these sources is listed in Table 9-1.

Table 9-1. Rock properties of subsurface lithologies at the Atomic City site.

Formation	**Bulk density**	**Dry bulk density**	**Grain density**	**P-wave velocity**	**S-wave velocity**	**Porosity**	**Water content**	**Water content**	**Hydraulic conductivity**	**Permeability**	**Shear strength**	**Compressive strength**	**Tensile strength**	**Bulk modulus**	**Young's modulus**	**Shear modulus**	**Poisson's ratio**
Units	g/cc	g/cc	g/cc	feet/second	feet/second	%	% (by weight)	% (by volume)	cm/sec	mD	psi	psi	psi	lbs/in^2	lbs/in^2	lbs/in^2	none
Soil zone	1.1–1.9[1] 1.23–1.48[2] 1.19–1.52[2]	1.0–1.9[1] 1.20–1.94[3]	2.52–2.89[3] 3.045–3.055[6]	N/A	N/A	25–39[1] 44–54[2] 43–56[2] 32.96–55.06[3]	12.7–22.8[3]	34.8–62.93	0.56–1.6[2] (E–3) 0.055–1.2[2] (E–2)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Basaltic volcanics	2.77-2.78[4] 2.65–2.80[5]	1.70–3.03[6] 2.40–2.86[7]	2.72–3.24[6] 3.03–3.11[7]	16,639–16,984[4] 15,500–18,000[5] 3,600–13,200[8] 11,800–20,000[9]	8,495–9,768[4] 2,150–6,180[8]	1–43[6]	N/A	N/A	N/A	0.002–5,402[6]	9.2–750.3[7]	2,967–15,484[7]	207–773[7]	5.95–6.73[4] (E+6) 0.244–7.021[8] (E+4)	7.12–8.95[4] (E+6) 0.499–6.388[8] (E+4)	2.69–3.57[4] (E+6) 0.198–2.435[8] (E+4)	0.25–0.32[4] 0.05–0.89[7] 0.06–0.44[8]
Sedimentary interbeds	1.79-2.44[4] 1.85–2.00[5]	N/A	N/A	4,727–13,781[4] 7,000–10,000[5] 1,500–3,600[8]	3,058–7,599[4] 920–2,000[8]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.27–3.71[4] (E+6) 0.048–0.364[8] (E+4)	0.62–4.87[4] (E+6) 0.081–0.381[8] (E+4)	0.23–1.90[4] (E+6) 0.033–0.164[8] (E+4)	0.10–0.37[4] 0.16–0.40[8]
Siliceous volcanics	1.68-2.47[4] 2.25–2.60[9]	N/A	N/A	6,291–14,792[4] 11,000–16,700[9]	3,192–7,315[4]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.00–3.04[4] (E+6) 0.59–4.23[4] (E+6)	2.09–3.89[4] (E+6) 0.61–4.11[4] (E+6)	0.75–1.65[4] (E+6) 0.23–1.53[4] (E+6)	0.18–0.39[4] 0.32–0.36[4]
Rhyodacite	2.45–2.65[9]	N/A	N/A	15,400–18,200[9]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

[1] 9-087
[2] 9-083
[3] 9-093
[4] 9-075
[5] 9-118
[6] 9-117
[7] 9-063, 9-064, 9-065
[8] 9-069
[9] 9-071

No information was found regarding the following rock properties: void ratio, Atterberg limits, compaction, consolidation-swell
N/A – no data found

9.3.1.6 Historically Reported Earthquakes Affecting the Atomic City Site

This section discusses historically reported earthquakes that have affected or could reasonably be expected to have affected the Atomic City site. Information on historical earthquakes within 200 miles of the Atomic City site was obtained from four catalog sources, including:

- University of Utah Seismograph Stations (UUSS): single network, 1962 to 2006 (9-045, 9-111),
- INL: single network, 1973 to 2005 (9-041, 9-116),
- USGS National Earthquake Information Center (NEIC): composite of various networks, 1973 to present (9-037, 9-109), and
- Geological Society of America Decade of North American Geology (DNAG): composite of various networks, pre-1973 (9-039, 9-100).

Among the many catalogs available from universities, federal agencies, and state agencies, these four catalogs were selected as the best available data for detailed site information (INL and UUSS catalogs) and uniform long-term coverage over a 200-mile radius from the Atomic City site (NEIC and DNAG catalogs).

University of Utah Seismograph Stations

The historical earthquake record in southeast Idaho and bordering areas of Montana, Wyoming, Nevada and Utah can be divided into a pre-instrumental period prior to about 1962, with epicenter locations and magnitudes based largely upon "felt" reports, and an instrumental period when seismographic coverage of the site region was initiated. Seismographic coverage of the site region came into existence in the early 1960s with the installation of six seismographs by the University of Utah to form a skeletal network called the UUSS. The University of Utah currently operates a 100-station seismic network serving Utah, eastern Idaho and western Wyoming. Figure 9-8 shows epicenter locations from the UUSS catalog. Note that the areal extent of UUSS coverage is truncated at latitude 42.5N and longitude 114.2W (i.e., does not cover the entire area within a 200-mile radius of the Atomic City site).

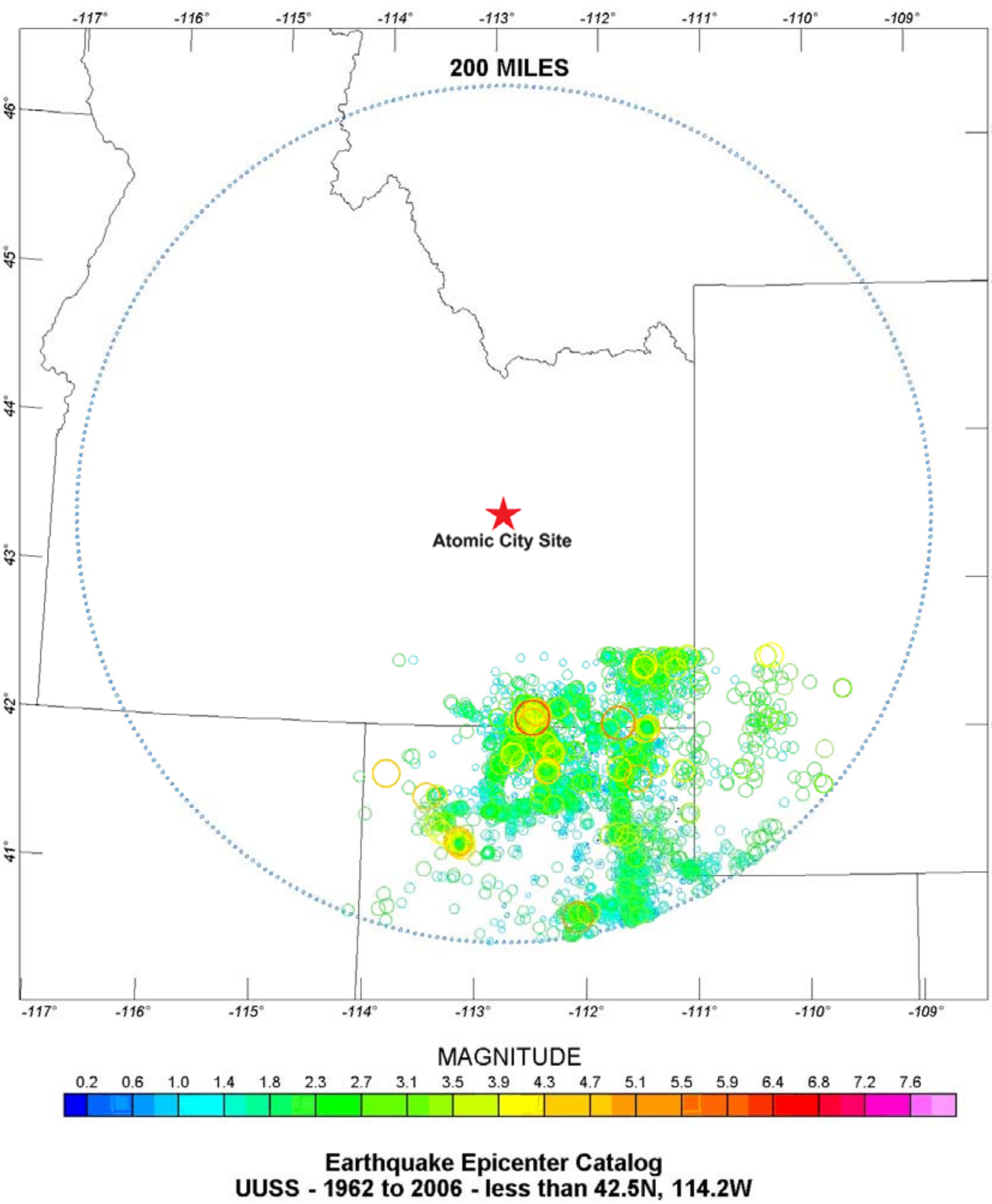

Figure 9-8. UUSS catalog epicenter locations (9-045, 9-111).

Idaho National Laboratory Seismic Network

Seismic monitoring coverage for the Atomic City area was significantly improved with the installation of 11 strong motion accelerographs at the INL in 1973. The INL currently operates 31 strong-motion accelerographs surrounding the INL. Figure 9-9 shows epicenter locations from the INL catalog. Note that the areal extent of INL coverage is limited to a 100-mile radius from the INL.

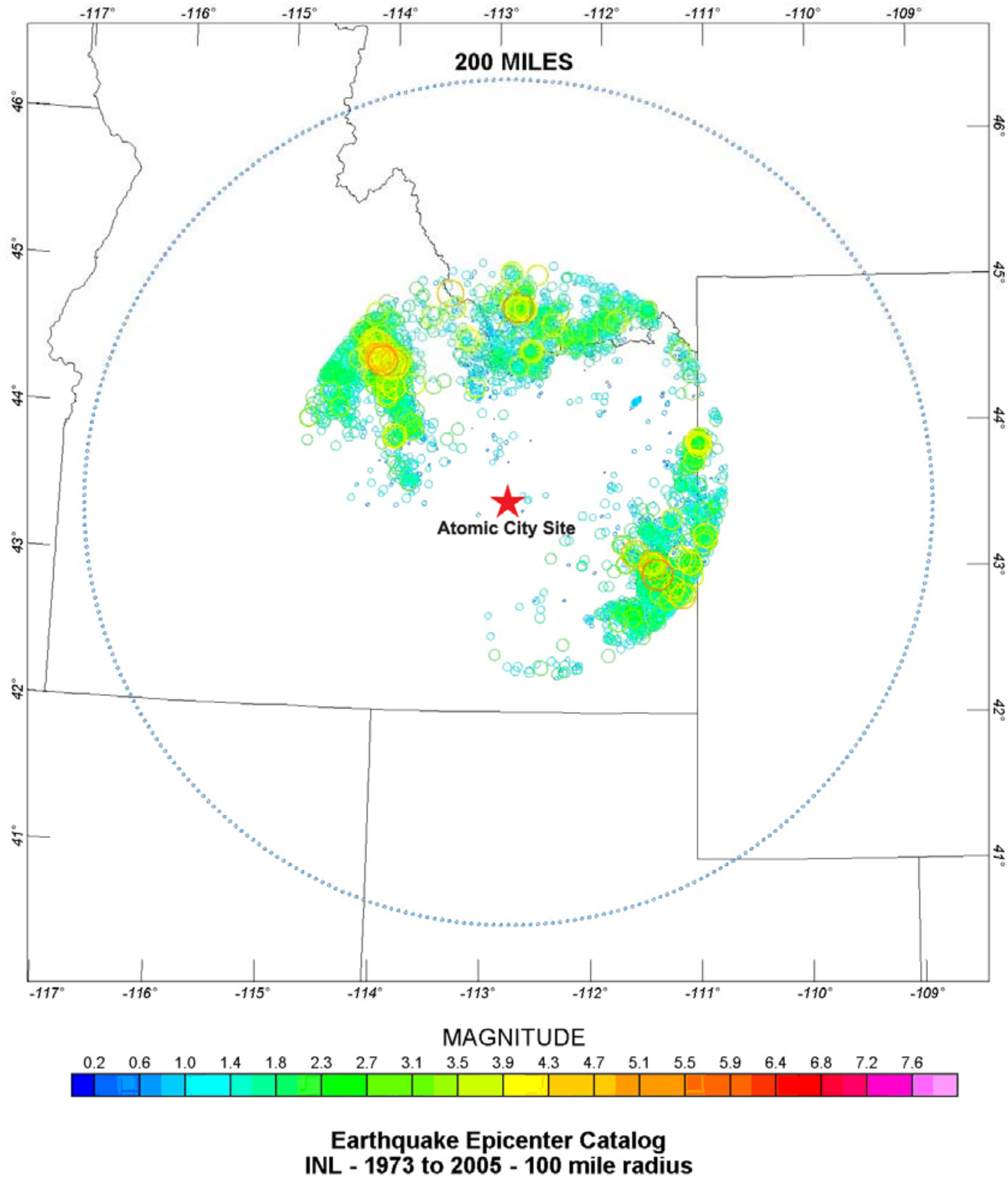

Figure 9-9. INL catalog epicenter locations (9-041, 9-116)

USGS National Earthquake Information Center

The USGS NEIC has the mission of compiling the location and size of all destructive earthquakes and to disseminate the information to concerned parties. The NEIC draws fundamental ground motion information directly from stand-alone networks such as the INL and UUSS, as well as maintaining its own stations at strategic locations, thus providing a source for earthquake information for earthquake events that occur outside the coverage area of individual networks. Figure 9-10 shows NEIC epicenter locations; the data cover the entire 200-mile radius from the Atomic City site.

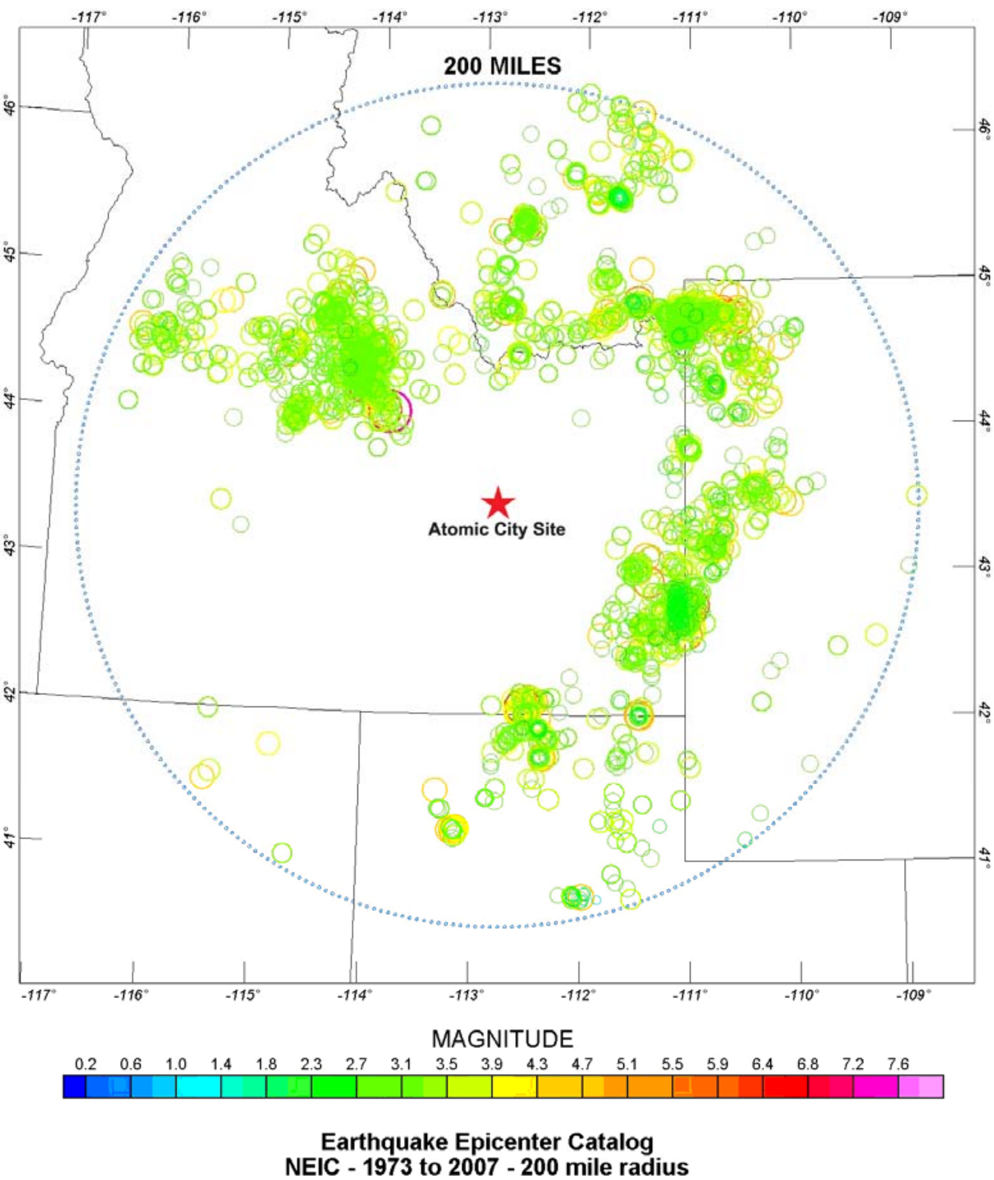

Figure 9-10. NEIC catalog epicenter locations (9-037, 9-109).

Decade of North American Geology Project

The DNAG was established by the Geological Society of America to celebrate its 1988 Centennial year. The project was intended to provide a massive, systematic synthesis of geological knowledge of North America to serve as a benchmark of research up through the 1980s. This effort included a compilation of historic earthquake data that included southeast Idaho epicenter information for the pre-instrumentation period (9-039). The DNAG epicenter catalog was obtained to provide historic earthquake data prior to the formal network compilations that began in the 1960s and 1970s. Figure 9-11 shows DNAG epicenter locations; the data cover the entire 200-mile radius from the Atomic City site.

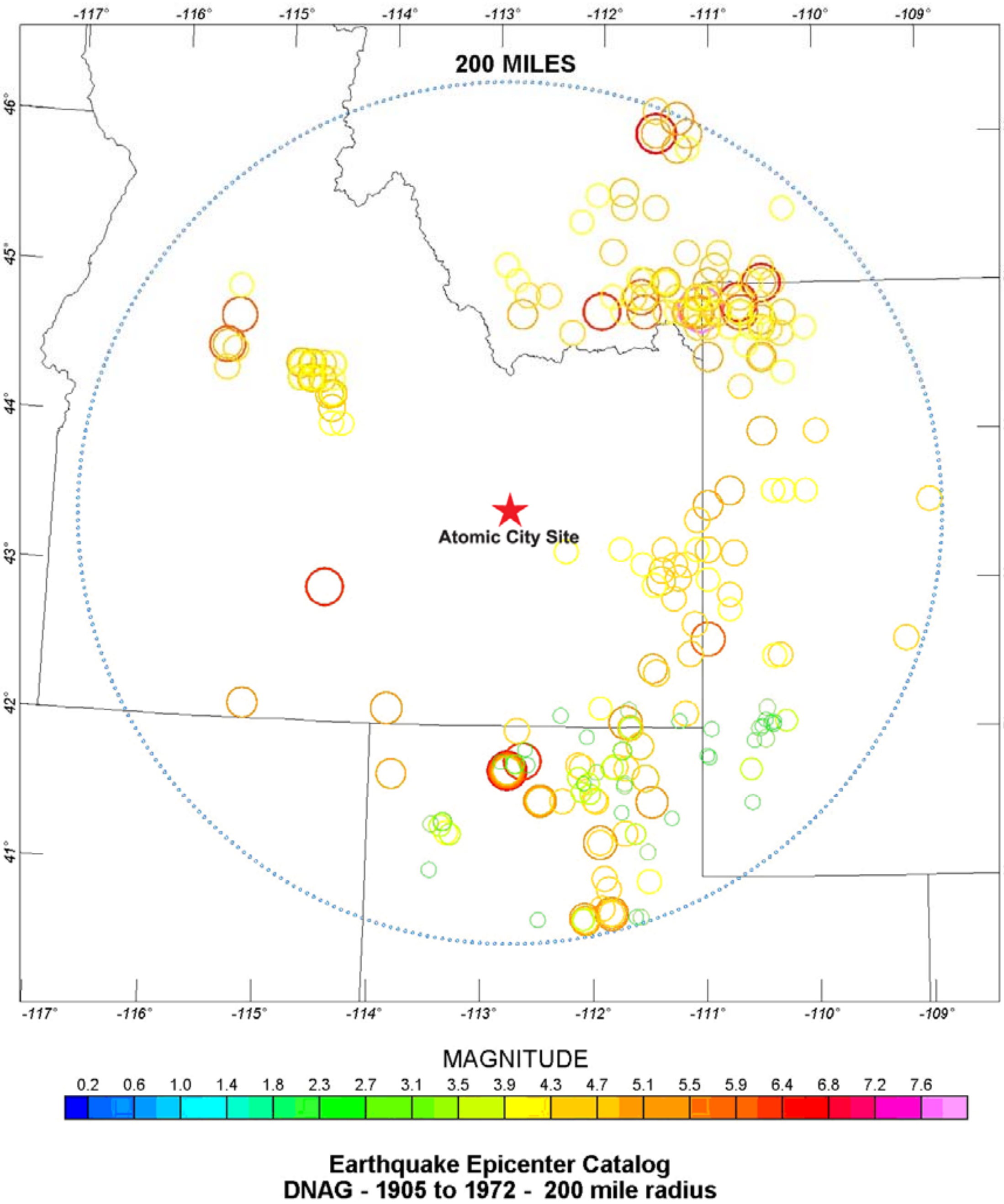

Figure 9-11. DNAG catalog epicenter locations (9-039, 9-100).

A summary of the earthquake epicenter information contained in these catalogs is given in Table 9-2.

Table 9-2. Summary of epicenter information from selected seismicity catalogs (9-100, 9-109, 9-111, 9-116).

	Catalog				
Data Set Attribute	**INL**	**UUSS**	**NEIC**	**DNAG**	**Totals**
Catalog Type	Network	Network	Composite	Composite	N/A
Number of Events	8,654	10,675	2,319	274	21,922
Minimum Event Year	1973	1962	1973	1905	1905
Maximum Event Year	2005	2006	2007	1972	2007
Magnitude Type	M_L	M_L	Various	Various	N/A
Minimum Event Magnitude	0.0	0.0	1.6	2.5	0.0
Maximum Event Magnitude	5.4	6.0	7.3	7.3	7.3
Average Event Magnitude	1.2	1.3	3.3	4.3	1.8
Events w/ Magnitude 5.0 or Greater	4	3	28	57	See Note
Events w/ Magnitude 6.0 or Greater	0	1	3	13	See Note
Minimum Epicenter Distance from Site (miles)	0.6	67.5	56.5	31.6	0.6
Maximum Epicenter Distance from Site (miles)	114.1	200.0	200.0	198.7	200.0

Note: Total not shown since events may be duplicated in more than one catalog.
M_L = Local magnitude (Richter magnitude): magnitudes originally measured on now obsolete seismographs. M_L values are calculated using modern equipment and making appropriate data adjustments.

9.3.1.7 Significant Earthquakes within 200 Miles of Site

Historical earthquakes within 200 miles of the Atomic City site range from magnitude (M)0.0 (unspecified magnitude scale) to M7.3, with a large majority of these events having magnitudes of 4.0 or less, as shown in Table 9-3. According to the INL earthquake database, there have been 242 earthquakes having magnitudes exceeding 3.0 within 100 miles of the Atomic City site in the period from 1973 to 2005, with four of these earthquakes exceeding M5.0, and none exceeding M6.0 (9-116). According to the NEIC earthquake database for the entire 200-mile Atomic City site radius, there have been 1,786 earthquakes exceeding M3.0, with 28 exceeding M5.0 and three exceeding M6.0 (9-109).

The historical earthquake record (1884-2001) shows that the ESRP is seismically quiet (aseismic) relative to the surrounding Basin-and-Range Province, with the exception of the 1905 Shoshone earthquake of M5.7. Since the installation of the INL seismic network in 1971, only 29 small magnitude microearthquakes (M<1.5) have been detected within the ESRP. In contrast, thousands of earthquakes have occurred in the Basin-and-Range Province surrounding the ESRP (9-019). The Atomic City site lies in an area of relatively sparse seismicity corresponding to the ESRP, as shown in Figures 9-8 through 9-11. According to the INL earthquake catalog, there have been only three earthquakes within 50 miles of the site exceeding M2.0, and none exceeding M3.0 during the period from 1973 through 2005 (9-116).

The pre-instrumentation DNAG earthquake catalog lists only one earthquake (M4.1) within 50 miles of the Atomic City site since 1905 (9-100).

Table 9-3. Summary of earthquake magnitudes within 200 miles of the Atomic City site (9-100, 9-109, 9-111, 9-116).

Magnitude	INL catalog	NEIC catalog	UUSS catalog	DNAG catalog
0 to <1	2,983	0	3,304	0
1 to <2	4,650	7	5,670	0
2 to <3	779	526	1,482	31
3 to <4	212	1,501	192	18
4 to <5	26	257	24	168
5 to <6	4	25	2	44
6 to <7	0	2	1	12
7 to <8	0	1	0	1
8+	0	0	0	0
Total	8,654	2,319	10,675	274

The two largest earthquakes within the 200-mile radius were the 1959 Hebgen Lake quake and the 1983 Borah Peak quake. Of these events, only the Borah Peak earthquake occurred during the modern instrumentation period. Information about these quakes is presented in Table 9-4 and discussed in the following subsections.

Table 9-4. Largest historical earthquakes within 200 miles of the Atomic City site (9-103, 9-105, 9-110).

Event Name	Magnitude	Intensity	Year	Distance to Site
Hebgen Lake, Montana	M7.3	V	1959	130 miles
Borah Peak, Idaho	M6.9	VI	1983	68 miles

Hebgen Lake

The Hebgen Lake earthquake is the largest recorded earthquake in Montana. Aftershocks of the Hebgen Lake earthquake included a ≤ M6.5 event that has been assigned to extreme northwestern Wyoming, and is the largest recorded earthquake in Wyoming. Figure 9-12 shows an isoseismal (i.e., zones of equal seismic intensity) map for the Hebgen Lake earthquake. The predicted intensity at the Atomic City site from the main Hebgen Lake event was Intensity V.

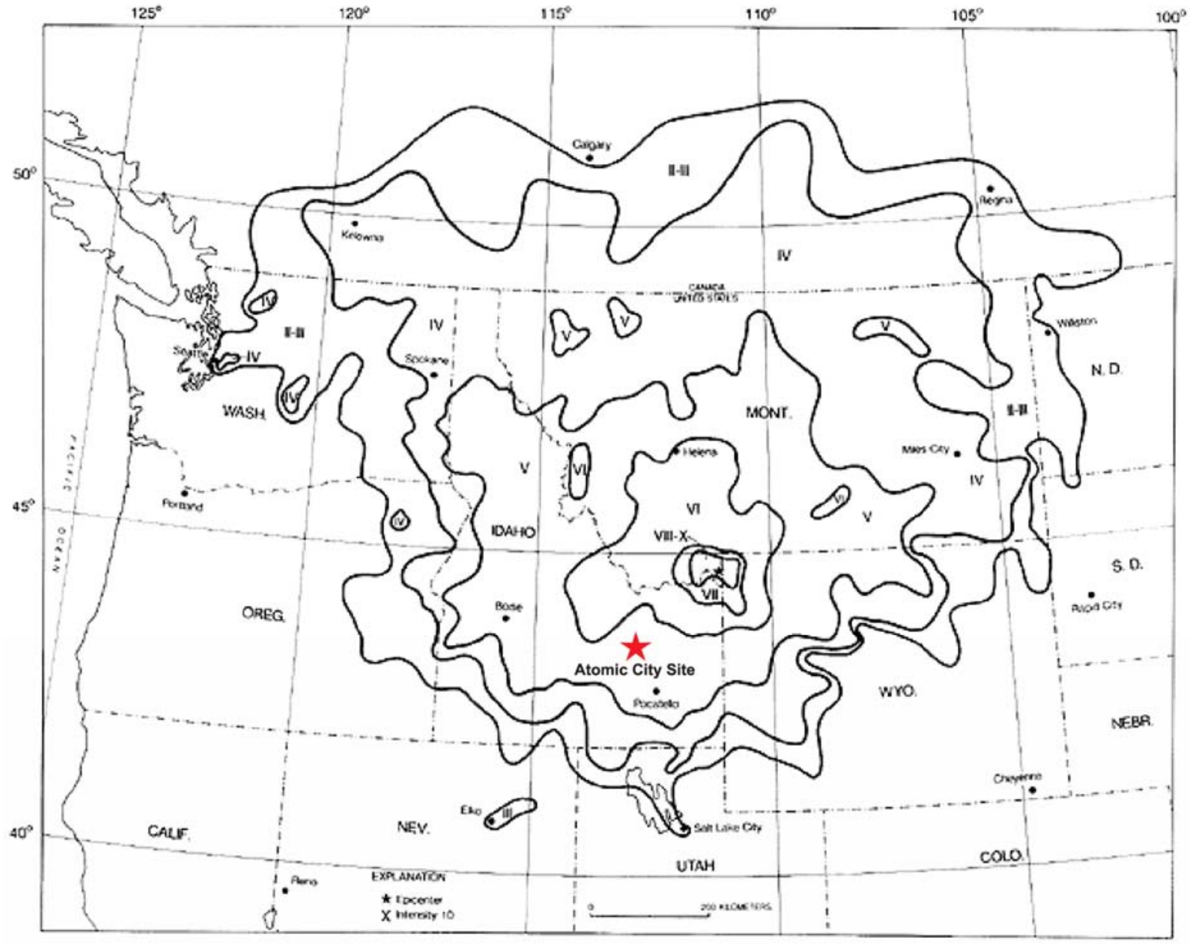

Figure 9-12. Isoseismal map for the Hebgen Lake earthquake (9-105, 9-110).

Borah Peak

The Borah Peak earthquake is the largest recorded earthquake in Idaho. Figure 9-13 shows an isoseismal map for the Borah Peak earthquake. The predicted intensity at the Atomic City site from the main Borah Peak event was Intensity VI.

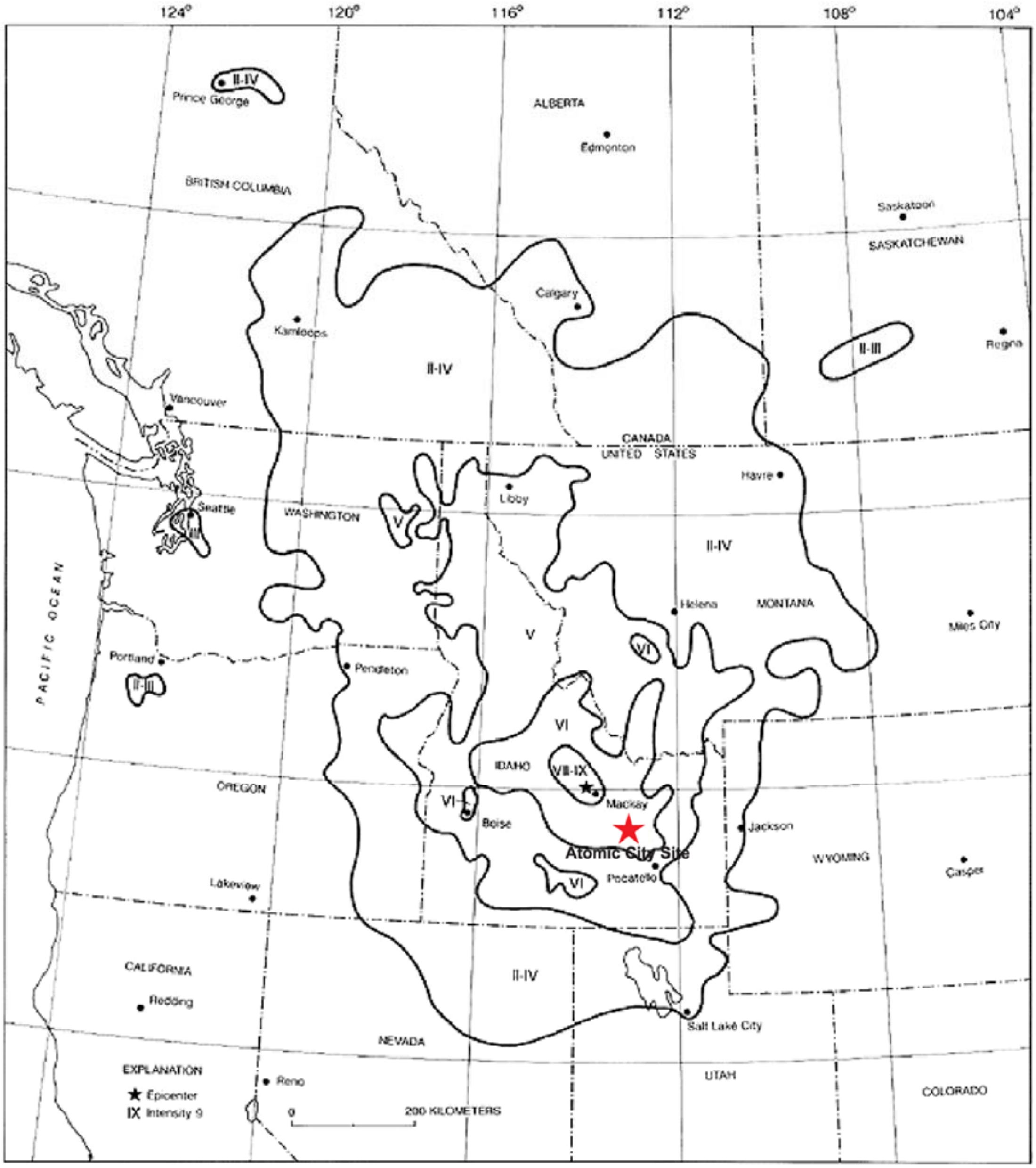

Figure 9-13. Isoseismal map for the Borah Peak earthquake (9-103, 9-110).

9.3.1.8 Correlation of Highest Intensity Epicenters to Tectonic Structures

For the Hebgen Lake and Borah Peak earthquakes, Table 9-5 summarizes what is known about their association with tectonic structures.

Table 9-5. Significant historical earthquakes and associated tectonic provinces within 200 miles of the Atomic City site (9-099, 9-110).

Event Name	Associated Tectonic Structure	Tectonic Province	References
Hebgen Lake, Montana	Surface rupture on Hebgen and Red Canyon Faults	Basin-and-Range, Yellowstone Plateau	9-110 9-099
Borah Peak, Idaho	Surface rupture on the Lost River fault	Basin-and-Range	9-110

Figure 9-14 shows earthquakes of M3.0 or greater that have occurred within 200 miles of the Atomic City site, based on the INL, UUSS, and NEIC earthquake catalogs. Figure 9-15 shows earthquakes of M5.0 or greater that have occurred within 200 miles of the Atomic City site since 1905, based on the NEIC and DNAG earthquake catalogs. These earthquakes are not uniformly distributed, but occur in a “V” pattern with its vertex near Yellowstone National Park and its arms sweeping around the margins of the Snake River Plain approximately 60 to 70 miles northwest and east of the Atomic City site. The northwest arm of the seismic belt is known as the Centennial Tectonic Belt and includes the Hebgen Lake and Borah Peak earthquakes. The eastern arm of the “V” is part of the Intermountain Seismic Belt, which continues north into Montana and south into Utah. The intersection of these belts occurs at the Yellowstone Plateau area.

Earthquakes within the seismic belts surrounding the ESRP occur in clusters, with the most significant event densities associated with the Lost River Range to the west, the Yellowstone Plateau in Wyoming to the northeast, the Hansel Mountains in Utah to the south, and the Grand Valley (Wyoming) and Grays Range (Idaho) area to the southeast. An additional area of clustered seismicity corresponds with the northern Utah Wasatch Front and its extension into Idaho. None of these clusters are known to be associated with human activities such as groundwater pumping, mining, or reservoir loading.

Figure 9-15, which shows only events having M5.0 or greater from the DNAG and NEIC catalogs, depicts a similar geographic event clustering. Event clusters associated with the Lost River Range, Hansel Mountains, Grand Valley – Gray’s Range and northern Wasatch Front are all associated with the Basin-and-Range tectonic province, an active extensional tectonic regime that spans the western U.S. from California on the west to Idaho and Utah on the east. Seismicity is concentrated at the western and eastern margins of the Basin-and-Range Province, and rupture is by normal faulting. The earthquake event cluster associated with the Yellowstone Plateau tectonic province is believed to be related to deep magmatic processes resulting from passage of the North American plate over a mantle hot spot. Neither the faulting nor the seismicity associated with these tectonic provinces is observed in the area of the Atomic City site location on the ESRP.

The event cluster associated with the Lost River Range includes the 1983 M6.9 Borah Peak earthquake and its aftershocks. The Hansel Mountains event cluster includes the 1934 M6.6 Kosmos – Hansel Mountains earthquake and aftershocks. The 1959 M7.3 Hebgen Lake earthquake and aftershocks occur on the fringes of the Yellowstone Plateau event cluster, in the area where it adjoins the Basin-and-Range and Northern Rocky Mountain tectonics provinces.

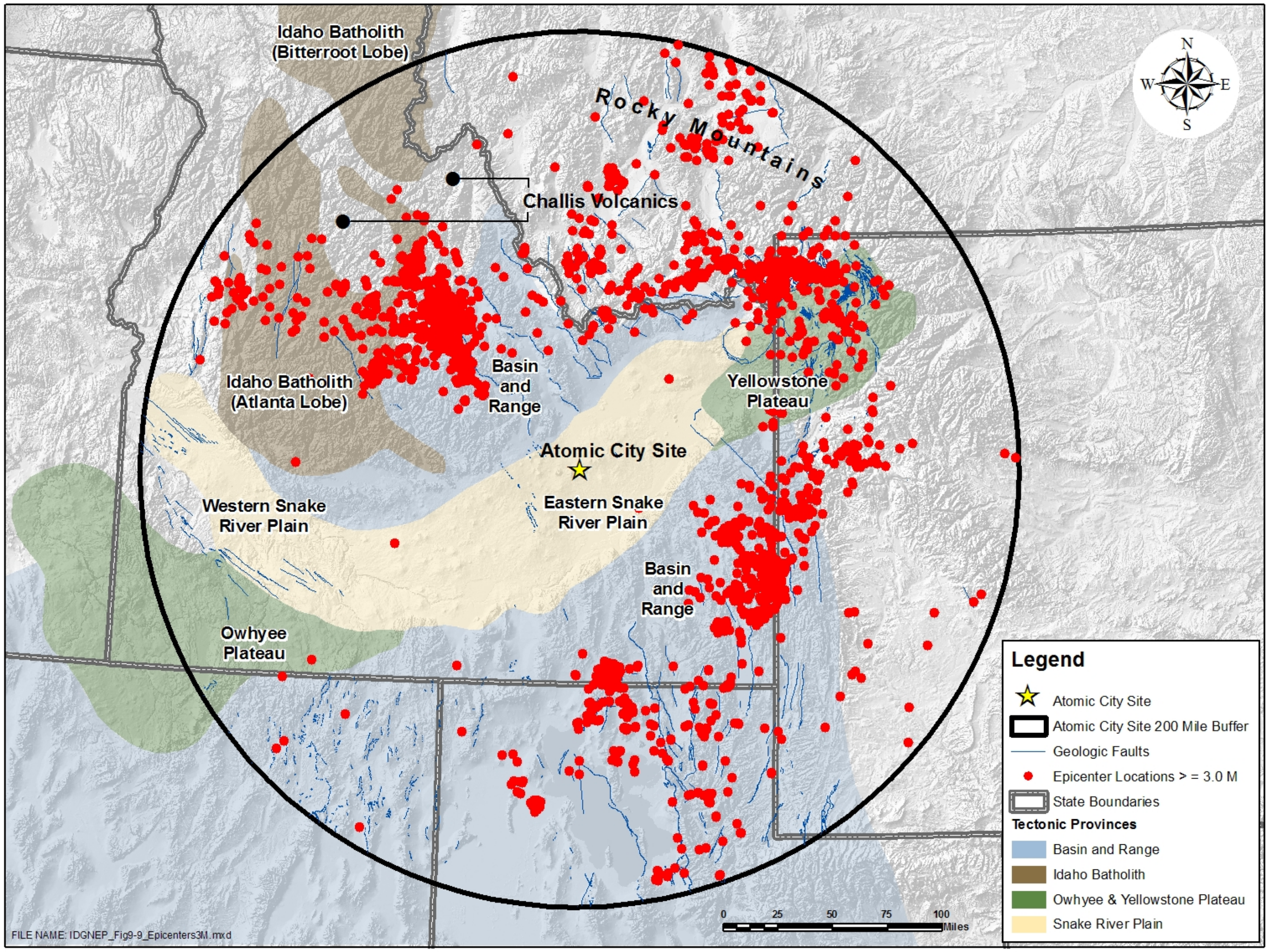

Figure 9-14. Epicenters of M3 or greater within 200 miles of the Atomic City site (9-095, 9-109, 9-111, 9-116).

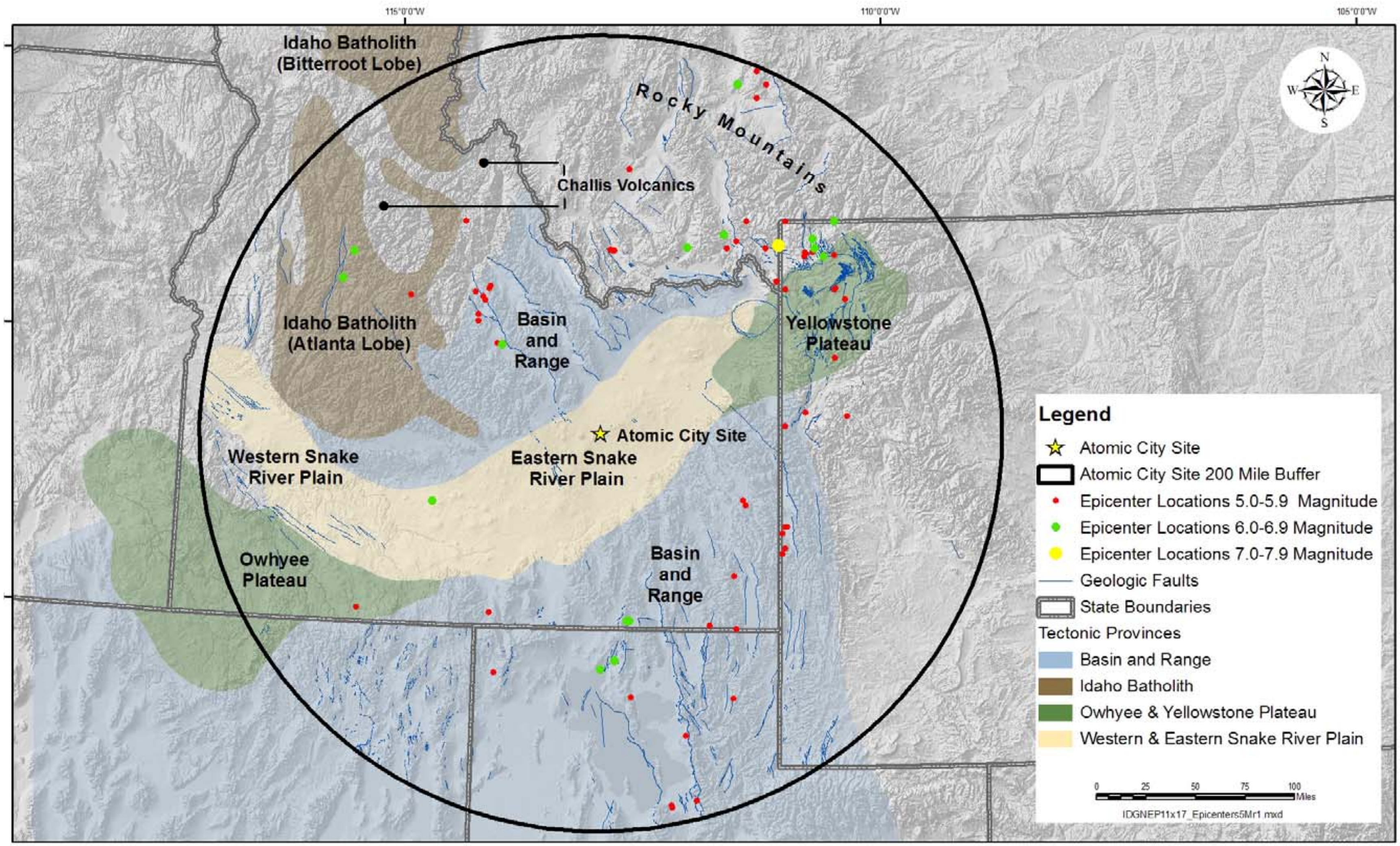

Figure 9-15. Epicenters of M5 or greater within 200 miles of the Atomic City site (9-095, 9-100, 9-109)

9.3.1.9 Evaluation of Fault Capability

NRC regulations (10 CFR 100, Appendix A, Table 1 [9-120]) require that geologic faults within a 200-mile radius of the site be examined as possible capable seismic sources. To perform this examination, the USGS Quaternary Fault and Fold Database of the United States (9-095) was imported into MapInfo geographic information system (GIS). This database is appropriate because NRC regulations state that in the absence of conflicting evidence, faults older than Quaternary age (i.e., older than 1.6 Ma) are not considered capable faults (10 CFR 100 Appendix A III(g) (9-120)). Within a 200-mile radius of the Atomic City site, 3,807 Quaternary faults are listed in the database.

A screening test was performed to eliminate faults that would not be significant in characterizing the Safe Shutdown Earthquake (SSE) using criteria in Table 9-6 (adapted from 10 CFR 100, Appendix A, Table 1 [9-120]). Only those faults that exceed a certain length must be characterized at various distances from the Atomic City site.

Table 9-6. Minimum lengths for faults that must be characterized based on distance from the Atomic City site (9-120).

Distance from the Site (miles)	Minimum Length (miles) [1]
0 to 20	1
Greater than 20, to 50	5
Greater than 50, to 100	10
Greater than 100, to 150	20
Greater than 150, to 200	40

[1] Minimum length of fault (miles) which shall be considered in establishing SSE.

Distance from the fault to the Atomic City site was measured in the GIS. Fault length was derived from the cited fault length in the Quaternary fault database. Of the 3,807 faults within 200 miles of the Atomic City site, 37 faults satisfied length/distance criteria identified in Table 9-6. Specifically, there are no faults within 20 miles, 9 faults from 20 to 50 miles, 20 faults from 50 to 100 miles, 7 faults from 100 to 150 miles, and 1 fault from 150 to 200 miles. These 37 faults, grouped by distance from the site, are listed in Table 9-7.

Table 9-7. Quaternary faults within 200 miles of the Atomic City site, grouped by distance (9-095).

Fault Name[1] Fault Number[2]	Length (mile)[1]	Associated Tectonic Structure[3]	Age (year)[1, 4]	Slip Sense[1]	Slip Rate (mm/yr)[1]	Geologic History of Displacement[1]
Faults 20 to 50 miles from Atomic City site						
Beaverhead fault, Blue Dome section (603f)	13.0	Basin-and-Range faulting: range-front normal fault separating Beaverhead Mountains from Lemhi River and Birch Creek valleys	<1,600,000	Normal	<0.2	History of this section of fault poorly understood; reconnaissance studies indicate no evidence of late Quaternary movement but data unavailable to provide more constraint. Slip rate of 0.1 mm/yr for southeast end of Beaverhead reasonable based on general absence of scarps on alluvium.
Lemhi fault, Howe section (602f)	11.2	Basin-and-Range faulting: long, normal fault along southwest base of Lemhi Range	15,000-35,000	Incomplete	0.2-1	Section displaces Late Pinedale glaciation deposits (10-35 ka). No published slip rates for this section. Trenching revealed a 24-meter-high scarp on deposits thought to be more than 100 ka; resulting slip-rate estimates would fall within assigned slip-rate category.
Lost River fault, Arco section (601f)	9.8	Basin-and-Range faulting: long, normal fault along southwest base of Lost River Range	20,000	Normal	<0.2	Section displaces undifferentiated Holocene and upper and middle Pleistocene alluvium and colluvium. On this section, scarps range from 2 to 25 meters; most about 12 meters. High scarps on deposits thought to be less than 600 ka; 2- to 3-meter-high scarps on 30-ka deposits; and deposits thought to be about 15 ka are unfaulted. May be up to 6.1 kilometers of late Cenozoic displacement across Lost River fault.
Lost River fault, Mackay section (601d)	5.7	Basin-and-Range faulting: long, normal fault along southwest base of Lost River Range	4,000 – 6,800	Normal	<0.2	Section displaces Holocene to middle Pleistocene fan alluvium. No published slip rate for this section. May be up to 6.1 kilometers of late Cenozoic displacement across Lost River fault.

Table 9-7. (continued).

Fault Name[1] Fault Number[2]	Length (mile)[1]	Associated Tectonic Structure[3]	Age (year)[1, 4]	Slip Sense[1]	Slip Rate (mm/year)[1]	Geologic History of Displacement[1]
Lost River fault, Pass Creek section (601e)	5.3	Basin-and-Range faulting: long, normal fault along southwest base of Lost River Range	<50,000	Incomplete	<0.2	Early regional studies infer most recent faulting event probably occurred 30-50 ka or prior to 15 ka due to absence of scarps on young alluvial deposits. Total slip estimated at 13.1-18.2 meters with preferred value of 17.2 meter, based on trenching. May be up to 6.1 kilometers of late Cenozoic displacement across Lost River fault.
Unnamed fault (609)	6.5	Basin-and-Range faulting: high-angle, normal fault along east side of bedrock ridge of Beaverhead Mountains	<1,600,000	Normal	<0.2	Fault poorly understood; no known studies completed at time of compilation. Fault is probably Quaternary structure. Low slip rate assigned based on lack of evidence to indicate otherwise.
Unnamed fault (608)	6.0	Basin-and-Range faulting: normal fault at southern end of Beaverhead Mountains	<1,600,000	Normal	<0.2	Fault poorly understood; no known studies completed at time of compilation. Fault is probably Quaternary structure. Low slip rate assigned based on lack of evidence to indicate otherwise.
Unnamed fault in Chandler Canyon (610)	7.1	Basin-and-Range faulting: normal fault along west side of Chandler Canyon within Beaverhead Mountains	<1,600,000	Normal	<0.2	Fault poorly understood; no known studies completed at time of compilation. Fault is probably Quaternary structure. Low slip rate assigned based on lack of evidence to indicate otherwise.
Unnamed fault near Lidy Hot Springs (611)	14.6	Basin-and-Range faulting: normal fault along southern part Beaverhead Mountains	<1,600,000	Normal	<0.2	Fault poorly understood; no known studies completed at time of compilation. Fault is probably Quaternary structure. Low slip rate assigned based on lack of evidence to indicate otherwise.

Table 9-7. (continued).

Fault Name[1] Fault Number[2]	Length (mile)[1]	Associated Tectonic Structure[3]	Age (year)[1, 4]	Slip Sense[1]	Slip Rate (mm/year)[1]	Geologic History of Displacement[1]
Faults 50 to 100 miles from Atomic City site						
Beaverhead fault, Baldy Mountain section (603d)	11.1	Basin-and-Range faulting: range-front normal fault bounding southwest side of Beaverhead Mountains	100,000	Normal	<0.2	Fault defined by aligned springs and discontinuous scarps on bedrock; fault age based on range-front morphology. This section has a very low slip rate based on general absence of scarps on late Quaternary deposits
Beaverhead fault, Leadore section (603c)	14.6	Basin-and-Range faulting: range-front normal fault bounding southwest side of Beaverhead Mountains	<15,000	Normal	<0.2	Morphologies of probable single-event fault scarps indicate a middle Holocene age for most recent faulting event. Scarps on early Pinedale-equivalent (25-30 ka) surfaces show vertical surface offsets from 2.4-3.5 meters, suggesting a slip rate much less than 0.2 mm/yr.
Beaverhead fault, Lemhi section (603a)	12.1	Basin-and-Range faulting: range-front normal fault bounding southwest side of Beaverhead Mountains	<750,000	Normal	<0.2	Reconnaissance studies show no evidence of scarps on latest Quaternary deposits. Scarps are present on middle Quaternary deposits, but recurrent movement may not have occurred in past 100,000 year based on range-front morphology. Long-term slip rate for section is probably one of lowest for the Beaverhead fault as reflected in low topographic relief, maximum 1.19 kilometers.
Beaverhead fault, Mollie Gulch section (603b)	10.2	Basin-and-Range faulting: range-front normal fault bounding southwest side of Beaverhead Mountains	<15,000	Normal	<0.2	Fault scarps are preserved on steep colluvial slopes, suggesting faulting may have occurred between 10-15 ka (post-glacial time). Long-term slip rate for this section is probably lowest for Beaverhead fault as reflected in low topographic relief, maximum 0.98 kilometers.

Table 9-7. (continued).

Fault Name[1] Fault Number[2]	Length (mile)[1]	Associated Tectonic Structure[3]	Age (year)[1, 4]	Slip Sense[1]	Slip Rate (mm/year)[1]	Geologic History of Displacement[1]
Beaverhead fault, Nicholia section (603e)	17.8	Basin-and-Range faulting: range-front normal fault bounding southwest side of Beaverhead Mountains	<15,000	Normal	<0.2	Section displaces Upper Pleistocene (~15 ka) glacial outwash, and upper Pleistocene and undifferentiated Pleistocene alluvium. Fault-specific studies suggest this section has very low slip rate based on 2.4- to 3.5-meter-high scarps on deposits estimated to be about 25 ka.
Deadman fault (606)	17.3	Basin-and-Range faulting: range-front and intrabasin normal fault bounding southwest side of Tendoy mountains	<1,600,000	Normal	<0.2	Total stratigraphic offset unknown; however, tuff that predates 5 Ma is offset more than 150 meters. Details of age of faulting are incomplete; fault aged from Tertiary to Holocene.
East Gem Valley fault (623)	14.4	Basin-and-Range faulting: range-front normal fault bounding Soda Springs Hills and Bear River Range	<130,000	Incomplete	<0.2	Indeterminate age: researchers have aged fault as younger that 27 ka (faulted basalt scarp) to late Cenozoic. Low slip rate (0.03 mm/yr) inferred based on 150 meters of late Tertiary or Quaternary displacement of Edie School rhyolite.
East Muddy Creek fault (651)	11.5	Basin-and-Range faulting: high-angle normal fault bounding northeast side of Muddy Creek basin	<1,600,000	Normal	<0.2	History of fault is poorly known; little general agreement in the time of most recent movement. Considered to be a potential seismic source. Inferred low slip rate based on lack of data to indicate late Quaternary slip.
Eastern Bear Lake fault, northern section (2364a)	12.7	Basin-and-Range faulting: long, range-front normal fault bounding west side of Bear Lake Plateau and Pruess Range	<750,000	Incomplete	<0.2	Fault is aged as Middle and late Quaternary (<750 ka) based on movement on northern end of eastern Bear Lake fault. Based on the lack of compelling evidence for late Quaternary movement, a low slip rate is inferred. Net Tertiary slip is 1.9-4.0 kilometers.

Table 9-7. (continued).

Fault Name[1] Fault Number[2]	Length (mile)[1]	Associated Tectonic Structure[3]	Age (year)[1, 4]	Slip Sense[1]	Slip Rate (mm/year)[1]	Geologic History of Displacement[1]
Grand Valley fault, Prater Mountain section (726c)	10.3	Basin-and-Range faulting: range-front normal fault extending from ESRP along west base of Snake and Salt River ranges	<130,000	Normal	<0.2	Age assignment based on data suggesting that at least part of this section (range front loess-covered alluvial fans) has ruptured since 130 ka. Low slip-rate category assigned based on the absence of scarps on 70 ka deposits.
Grand Valley fault, Swan Valley section (726a)	15.6	Basin-and-Range faulting: range-front normal fault extending from ESRP along west base of Snake and Salt River ranges	<1,600,000	Incomplete	<0.2	Fault aged as Quaternary based on fault scarp on 1.5±0.8 Ma Pine Creek Basalt. Average Quaternary displacement (slip) rate is 0.019 mm/yr based on presence of a 28-meter-high scarp on 1.5±0.8 Ma Pine Creek basalt.
Heise fault (621)	14.9	Basin-and-Range faulting: normal fault of low topographic relief northeast of Snake River	<15,000	Incomplete	<0.2	Several researches show fault as late Quaternary (<15 ka). Overall expression of fault indicates a low rate of slip; no data are published to further quantify a slip rate.
Island Park Caldera Rim fault (619)	35.5	Collapsed caldera rim faulting: curvilinear and short linear scarps probably related to volcanic collapse	1,200,000	Normal	<0.2	Fault is of questionable seismogenic origin. Rim faults caused by eruption of Early Quaternary Mesa Falls Tuff (1.2 Ma) and subsequent collapse of Island Park caldera. Maximum slip rate of 0.01 mm/yr is possible for the past 195 ka.
Lemhi fault, May section (602b)	21.4	Basin-and-Range faulting: long normal fault along southwest base of Lemhi Range	7,000 – 12,000	Normal	0.2-1	Fault age constrained to 7-12 ka; presence of Mazama ash infilling a preexisting graben (7 ka) and presence of scarp on post-glacial deposit (12 ka). Fault-specific studies suggest section has a low slip rate based on general absence of nearly 5-meter-high scarps on latest Quaternary deposits.

Table 9-7. (continued).

Fault Name[1] Fault Number[2]	Length (mile)[1]	Associated Tectonic Structure[3]	Age (year)[1, 4]	Slip Sense[1]	Slip Rate (mm/year)[1]	Geologic History of Displacement[1]
Lone Pine fault, northern section (604a)	13.7	Basin-and-Range faulting: range-front normal fault separating Antelope Flat and Round Valley from Lone Pine Peak	<1,600,000	Normal	<0.2	General absence of documented scarps on alluvium suggests section may be substantially older than prehistoric scarps to south. Conjugate with Lost River fault which is considered master fault. Low slip-rate category assigned based on general absence of scarps on alluvium.
Lost River fault, Challis section (601a)	16.5	Basin-and-Range faulting: long normal fault along southwest base of Lost River Range	<1,600,000	Normal	<0.2	Reconnaissance studies indicate no evidence of late Quaternary movement. Slip rate inferred to be low based on absence of scarps on late Quaternary deposits. Long-term slip rate is probably lowest of any section on Lost River fault. May be up to 6.1 kilometers of late Cenozoic displacement across Lost River fault.
Lost River fault, Thousand Springs section (601c)	14.1	Basin-and-Range faulting: long normal fault along southwest base of Lost River Range	<150 (site of '83 Borah Peak earthquake)	Normal	<0.2	Most studies concur that pre-1983 faulting occurred during middle to early Holocene. Average throw across fault during 1983 Borah Peak earthquake was 0.8 meters but maximum was 2.7 meters, which occurred near middle of Thousand Springs section.
Unnamed fault along West Camas Creek (615)	12.8	Basin-and-Range faulting: high-angle normal fault along northeast side of West Camas Creek in Bitterroot Range	<1,600,000	Normal	<0.2	Fault is poorly understood; probably a Quaternary structure. Low slip rate assigned based on lack of evidence to indicate otherwise. Rate assigned based on analogy with nearby Deadman fault [Fault #606].

Table 9-7. (continued).

Fault Name[1] Fault Number[2]	Length (mile)[1]	Associated Tectonic Structure[3]	Age (year)[1, 4]	Slip Sense[1]	Slip Rate (mm/year)[1]	Geologic History of Displacement[1]
Wasatch fault zone, City section (2351a)	15.2	Basin-and-Range faulting: range-bounding normal fault along western side of Wasatch Range	<130,000	Normal	<0.2	Bonneville Lake lacustrine sediments (32-10 ka) lie undisturbed across fault; however, fault scarps are present on late Quaternary deposits. Low slip rate assigned based on absence of evidence supporting surface faulting in the past 15 ka.
Faults 100 to 150 miles from Atomic City site						
West Muddy Creek fault (652)	12.6	Basin-and-Range faulting: high-angle normal fault bounding southwest side of Muddy Creek basin	<1,600,000	Normal	<0.2	History of fault is poorly known; little general agreement in time of most recent movement. Fault has no features indicative of late Quaternary movement, but is considered to be potential seismic source. Inferred low slip rate based on lack of data to indicate late Quaternary slip.
Deadwood-Reeves Creek fault (605)	24.8	Basin-and-Range faulting: possible high-angle normal faults along west side of Deadman River and east side of East Fork Deadman River	<1,600,000	Normal	<0.2	Timing of the most recent event is poorly constrained. Minimum 500 meters displacement in horneblende-biotite granodiorite. Low slip rate assigned based on lack of evidence to indicate otherwise.
East Lakeside Mountains fault zone (2368)	22.4	Basin-and-Range faulting: two normal faults bounding west side of Great Salt Lake graben	<1,600,000	Incomplete	<0.2	Fault is entirely subaqueous; Quaternary based on the depth to faulted sediment and geophysical fault expression. Depth to faulted lake-bottom sediment indicates a low slip rate.
Faults along Lava Creek caldera margin (763)	57.4	Collapsed caldera rim faulting: faults form margin of Lava Creek caldera	630,000	Normal	<0.2	These faults are of questionable seismogenic origin. Movement probably related to eruption and subsequent rapid collapse of Lava Creek caldera about 630 ka; slip during subsequent middle and late Quaternary has been minimal (no younger deposits have been mapped as being displaced). Some rim faults represent gravitational collapse of caldera margin.

Table 9-7. (continued).

Fault Name[1] Fault Number[2]	Length (mile)[1]	Associated Tectonic Structure[3]	Age (year)[1, 4]	Slip Sense[1]	Slip Rate (mm/year)[1]	Geologic History of Displacement[1]
Owyhee Mountains fault system (636)	29.9	Basin-and-Range faulting?: faults form northwest-trending margin between Owyhee Mountians and WSRP	<1,600,000	Normal	<0.2	Most of fault zone is mapped as lesser Quaternary (<1.6 Ma) with exception of Halfway Gulch and Water Tank faults, which are mapped as lesser Holocene. Local trenching suggests five events occurred since 26±8 ka, and an age of the youngest event of about 3 ka. Estimates of 1.8-2.2 kilometers of offset across Owyhee Mountain of 11-16.6 Ma volcanic rocks indicate low rates of long-term slip.
Rocker fault (669)	30.1	Basin-and-Range faulting: range-front normal fault bounding east side of Divide Creek valley	<1,600,000	Normal	<0.2	Amount of structural throw is unpublished. Trenching studies do not preclude Quaternary movement but do exclude the possibility of Pleistocene movement. Evidence of Tertiary movement as well. Inferred low slip rate is based on absence of scarps on upper Quaternary deposits and faulted late Quaternary deposits in trench.
Ruby Range western border fault (665)	23.8	Basin-and-Range faulting: high-angle range-front normal fault bounding northwest side of Ruby Range	<1,600,000	Normal	<0.2	Amount of structural throw is unknown. Timing of faulting is poorly constrained; different researchers have assigned age as late Tertiary (Pliocene) though the consensus seems to indicate early to mid Quaternary. Inferred low slip rate is based on absence of scarps.
Tobacco Root fault (649)	20.9	Basin-and-Range faulting: high-angle, range-front normal fault bounding western side of Tobacco Root Mountains	<1,600,000	Normal	<0.2	Faulted surficial deposits include Miocene-Pliocene Sixmile Creek Formation. Majority of faulting may have been completed during Tertiary, but Quaternary movement not precluded based on faceted-spur preservation. Inferred low slip rate based on absence of scarps.
Rocker fault (669)	30.1	Basin-and-Range faulting: range-front normal fault bounding east side of Divide Creek valley	<1,600,000	Normal	<0.2	Amount of structural throw is unpublished. Trenching studies do not preclude Quaternary movement but do exclude the possibility of Pleistocene movement. Evidence of Tertiary movement as well. Inferred low slip rate is based on absence of scarps on upper Quaternary deposits and faulted late Quaternary deposits in trench.

Table 9-7. (continued).

Fault Name[1] Fault Number[2]	Length (mile)[1]	Associated Tectonic Structure[3]	Age (year)[1, 4]	Slip Sense[1]	Slip Rate (mm/year)[1]	Geologic History of Displacement[1]
Ruby Range western border fault (665)	23.8	Basin-and-Range faulting: high-angle range-front normal fault bounding northwest side of Ruby Range	<1,600,000	Normal	<0.2	Amount of structural throw is unknown. Timing of faulting is poorly constrained; different researchers have assigned age as late Tertiary (Pliocene) though the consensus seems to indicate early to mid Quaternary. Inferred low slip rate is based on absence of scarps.
Tobacco Root fault (649)	20.9	Basin-and-Range faulting: high-angle, range-front normal fault bounding western side of Tobacco Root Mountains	<1,600,000	Normal	<0.2	Faulted surficial deposits include Miocene-Pliocene Sixmile Creek Formation. Majority of faulting may have been completed during Tertiary, but Quaternary movement not precluded based on faceted-spur preservation. Inferred low slip rate based on absence of scarps.
Faults 150 to 200 miles From Atomic City site						
Bitterroot fault (663)	56.3	Basin-and-Range faulting: high-angle, range-front normal fault bounding east side of Bitterroot Mountains	<1,600,000	Normal	<0.2	Generalized bedrock topography suggest possible minimum throw of 1.2-1.8 kilometers and maximum throw of approximately 3.3 kilometers. Localized historical and late Quaternary displacement is reported in the literature but conservative estimate of early Quaternary based on scarp morphology. Inferred low slip rate is based on ~7 meter slip on upper Quaternary (<130 ka) deposits.

1 Information from USGS Quaternary Fault and Fold Database of the United States (9-095).
2 Fault number is unique number assigned to the fault in the USGS Quaternary Fault and Fold Database of the United States (9-095), and is used to access the report compilation for that particular fault.
3 Associated tectonic structure is derived from fault morphology, structure, and spatial location.
4 Age is latest occurrence of fault movement at or near the surface. In many cases, data are lacking or insufficient to reasonably establish an age range.

mm/yr – millimeters per year

Of the faults listed in Table 9-7, the Howe section of the Lemhi fault is closest to the Atomic City site at 25.5 miles to the north (9-081). The next closest structure is the Arco section of the Lost River fault at 28 miles to the northwest (9-084). As mentioned previously, these faults are outside the ESRP.

As mentioned in Section 9.3.1.2, The Quaternary Fault and Fold Database identifies a structure set within the ESRP as "Idaho rift system faults," a network of fractures, tensional fissures, fault-scarp-like features and monoclines that are all associated with the intrusion of shallow igneous dikes in the underlying crust. These fault-like structures do not extend to significant depths in the crust, probably 5 kilometers or less, and therefore, do not pose a serious seismic threat. The historical seismicity in volcanic rift zones suggests that earthquakes induced by dike intrusions have maximum magnitudes of about 4 or less (9-077).

The faults listed in Table 9-7 were evaluated for fault capability, as defined in 10 CFR 100, Appendix A (9-120). To determine fault capability, metadata information found in the Quaternary Fault and Fold Database was evaluated against the definition of a capable fault in 10 CFR 100 Appendix A, which states in part that a fault is capable if there has been ground movement at or near the ground surface at least once in the past 35,000 years or movement of a recurring nature within the past 500,000 years.

The evaluation showed that only the Lava Creek caldera margin faults (Fault #763) (9-082) and the Island Park Caldera Rim fault (Fault # 619) (9-078) did not meet NRC criteria for capable faults. The Lava Creek caldera margin fault system has been dated at about 630,000 years with reasonable certainty because movement along the faults is probably related to eruption and subsequent rapid collapse of Lava Creek caldera, known to have occurred about 630 ka. Similarly, the Island Park Caldera Rim faults are associated with the eruption of the Mesa Falls Tuff and subsequent caldera collapse which occurred 1.2 Ma. Thus, both these fault systems have a bounding early age greater than 500,000 years and do not meet the NRC definition of a capable fault.

The remaining 35 faults shown in Table 9-7 are considered capable faults that must be characterized per NRC regulations. Characteristics are discussed in the following section.

9.3.1.10 Characteristics of Capable Faults

For each of the 35 capable faults, fault length, relationship of the fault to regional tectonic structures, and nature, amount, and geologic history of fault displacement are shown in Table 9-7.

The faults range in length from 5.3 miles (Lost River Fault, Pass Creek section; Fault #601e [9-042]) to 56.3 miles (Bitterroot fault; Fault #663 [9-043]). All of the capable faults are associated with Basin-and-Range range-front, normal faulting. This is reasonable and expected since most of the area within a 200-mile radius of the site falls within the Basin-and-Range tectonic province, as depicted in Figure 9-3. Also, extension related to this type of faulting is still an active geologic process.

In many instances, a particular fault has only been summarily investigated and information, particularly fault displacement, is lacking or inconclusive. The nature and amount of fault displacement was generally determined by regional or local geologic mapping, trenching, and/or evaluation of geomorphology, primarily the presence of scarps. All of the capable faults had a normal (or incomplete due to inconclusive data) slip sense which is consistent with Basin-and-Range faulting. Nearly all of the faults were assigned the slip rate category of less than 0.2 millimeters per year; many of these had actual slip rates an order of magnitude lower. Only the Howe section of the Lemhi fault (9-081) and the May section of the Lemhi fault (9-076) were assigned the slip rate category of 0.2 to 1.0 millimeters per year.

9.3.1.11 Summary of Vibratory Ground Motion

In 2002, USGS issued the latest revision of the National Seismic Hazard Maps, which predict earthquake ground motions for all locations within the nation (9-101, 9-102). These maps were produced using a probabilistic seismic hazard analysis (PSHA) that incorporates both areal background zones of seismicity (based on historic seismicity, such as described in Sections 9.3.1.6 and 9.3.1.7), and active fault zones (such as the capable faults described in Sections 9.3.1.8 and 9.3.1.9). Predicted hazard data and maps customized for the Atomic City site were obtained from the National Seismic Hazard Map website (9-108).

The USGS differentiates physical ground motion effects at the site of interest using three categories (9-101):

- PGA: maximum acceleration experienced by a particle on the ground during the entire course of the earthquake motion,
- 0.2-second spectral acceleration (SA): high-frequency vibrations of the ground surface, and
- 1.0-second SA: low-frequency vibrations of the ground surface.

Figures 9-16 through 9-21 are USGS maps of predicted ground motion from future earthquakes at the Atomic City site and the surrounding regions. Figures 9-16 through 9-18 show predicted ground acceleration for a 10 percent probability of exceedance (PE) in 50 years (approximate return period of 475 years). Specifically, Figure 9-16 shows the PGA, Figure 9-17 shows the 0.2-second SA, and Figure 9-18 shows the 1.0-second SA for a 10 percent PE in 50 years.

Similarly, Figures 9-19 through 9-21 show predicted ground acceleration for a 2 percent PE in 50 years (approximate return period of 2,475 years). Specifically, Figure 9-19 depicts the PGA, Figure 9-20 depicts the 0.2-second SA, and Figure 9-21 depicts the 1.0-second SA for a 2 percent PE in 50 years. The ground motion values predicted for the site are shown in Table 9-8.

Table 9-8. Ground motion values for the Atomic City site (9-101, 9-102, 9-108).

	10 percent PE in 50 years (%g)	**2 percent PE in 50 years (%g)**
PGA	6.75 (Figure 9-16)	11.95 (Figure 9-19)
0.2-second SA	15.78 (Figure 9-17)	29.04 (Figure 9-20)
1.0-second SA	6.58 (Figure 9-18)	11.97 (Figure 9-21)

The predicted ground motion values at the site are relatively low as shown in Table 9-8: 0.06g to 0.15g for 10 percent PE in 50 years and 0.11g to 0.30g for 2 percent PE in 50 years. These values reflect several factors at the site: 1) the low rates of historic earthquake occurrence in the area immediately surrounding the site, 2) the low magnitudes of such earthquakes, and 3) the distance (greater than 25 miles) to Quaternary faults capable of generating larger earthquakes.

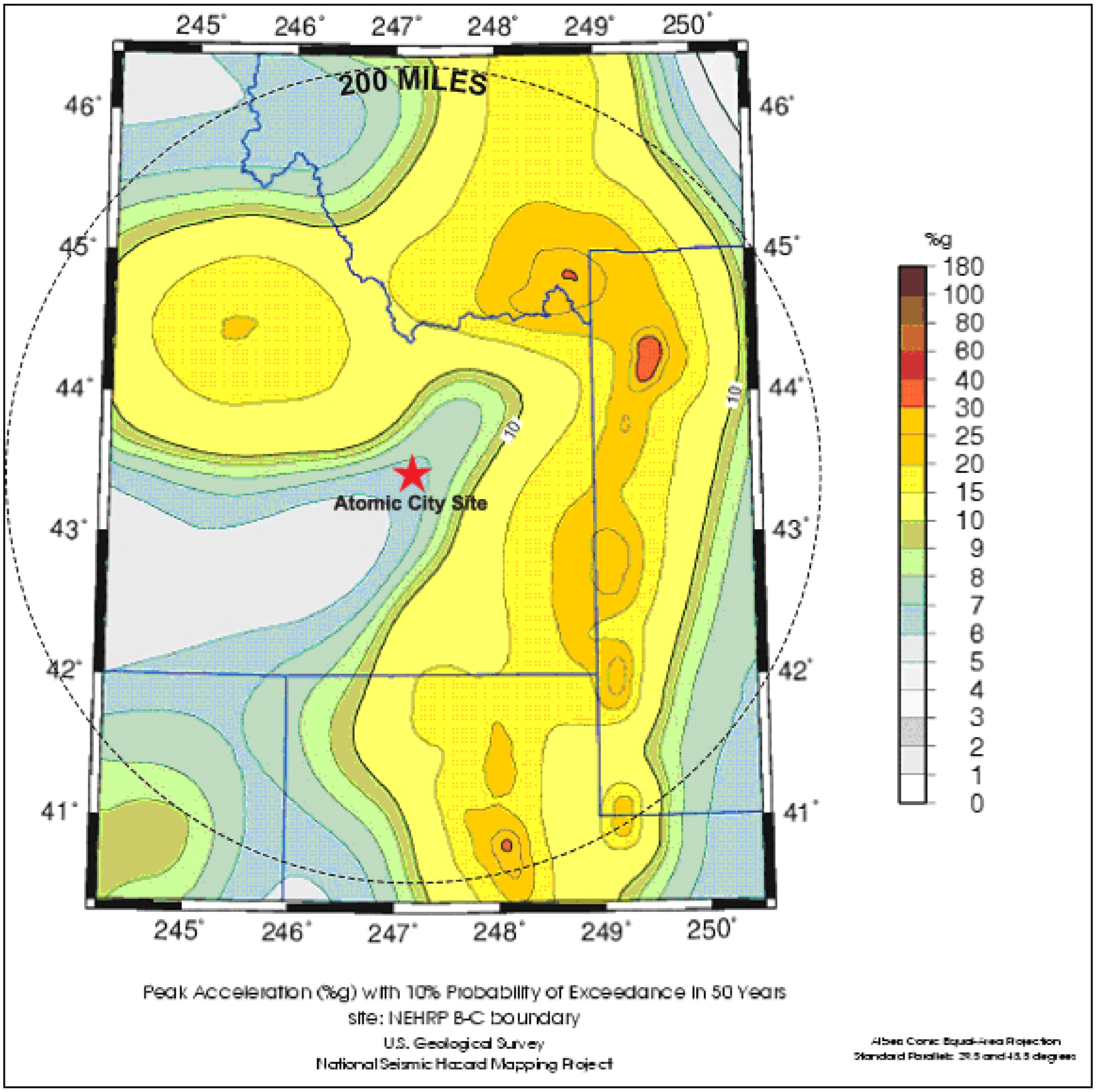

Figure 9-16. Predicted PGA for a 10 percent PE in 50 years (9-101, 9-102, 9-108).

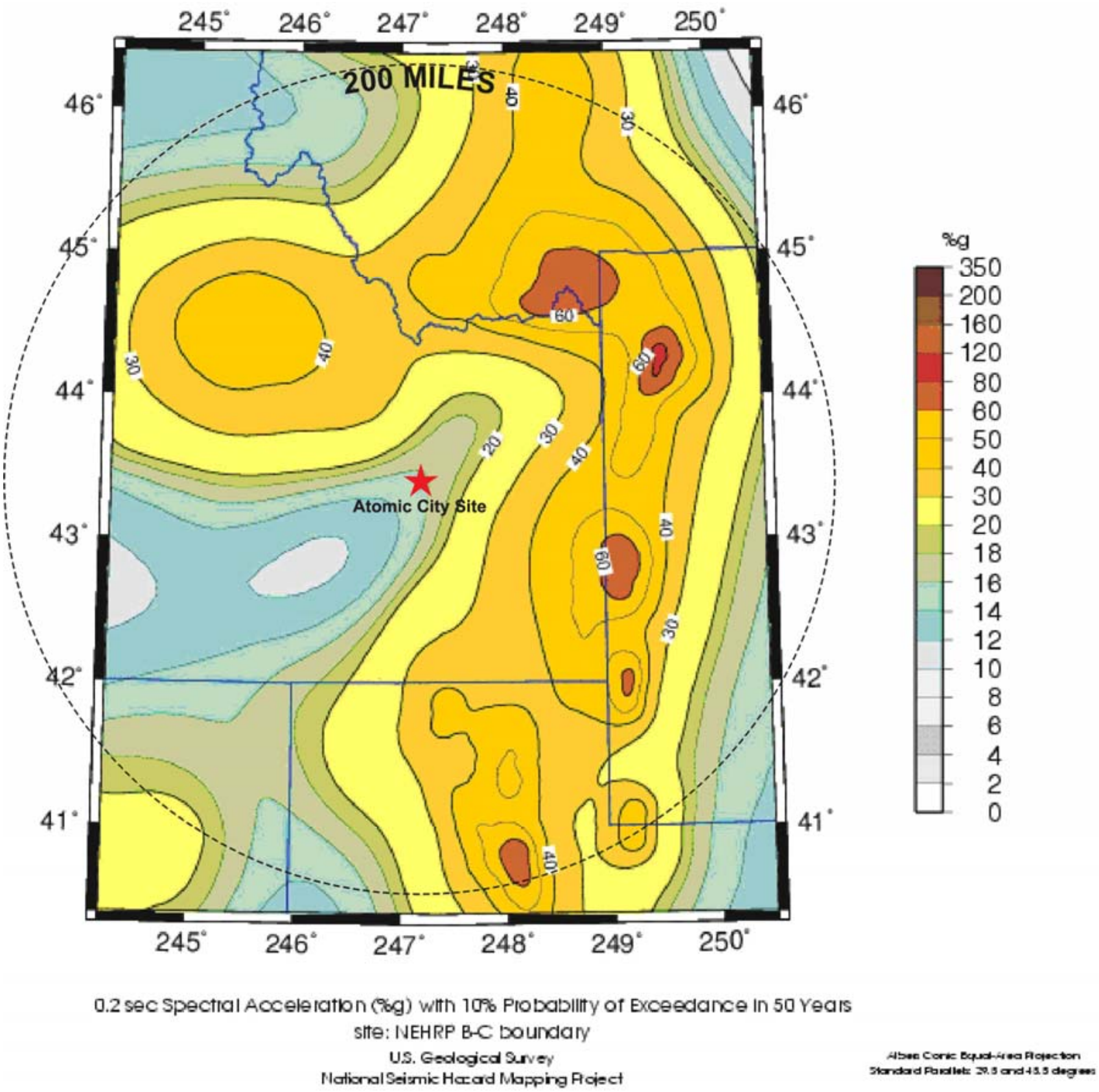

Figure 9-17. Predicted 0.2-second SA for a 10 percent PE in 50 years (9-101, 9-102, 9-108).

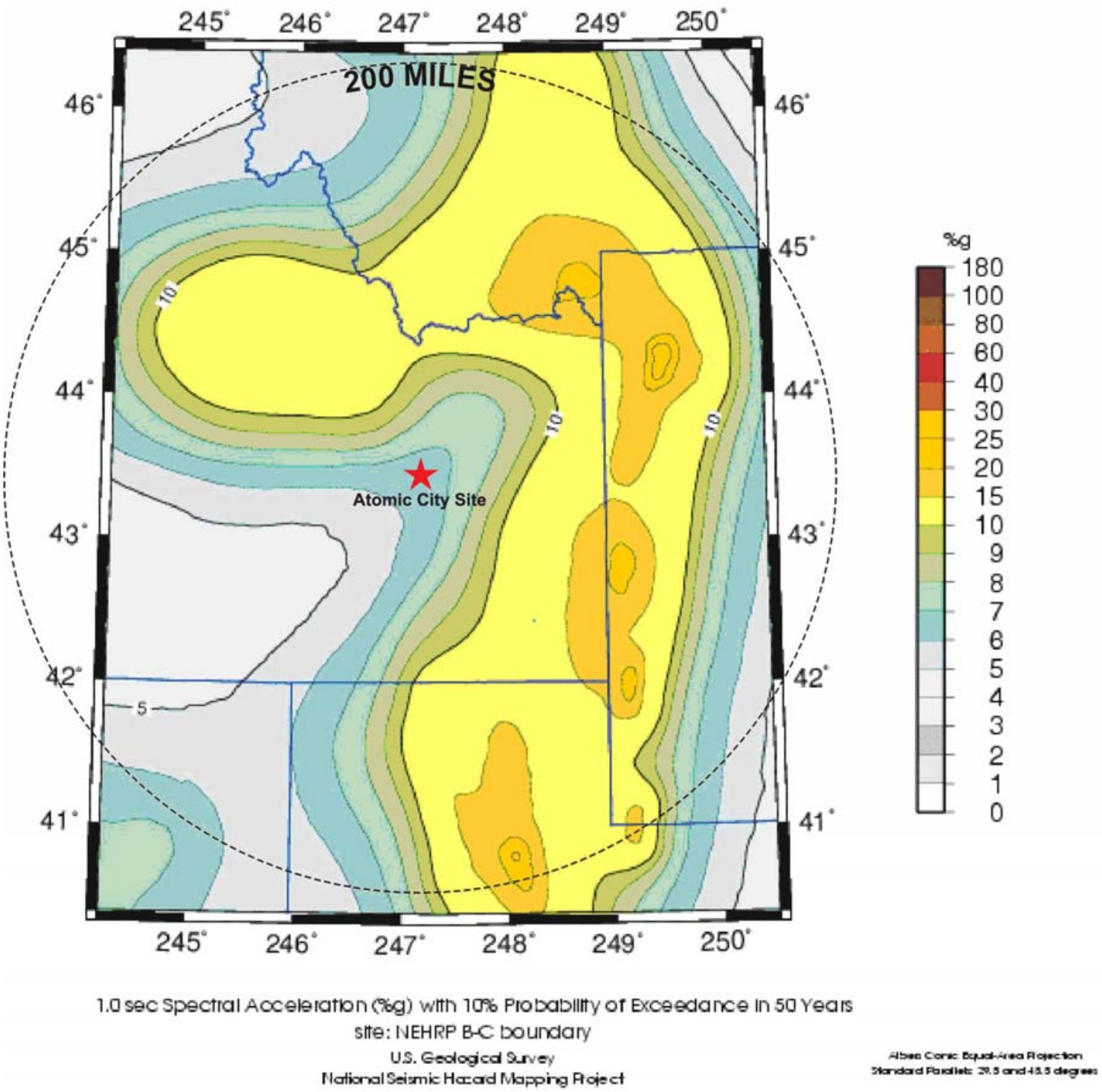

Figure 9-18. Predicted 1.0-second SA for a 10 percent PE in 50 years (9-101, 9-102, 9-108).

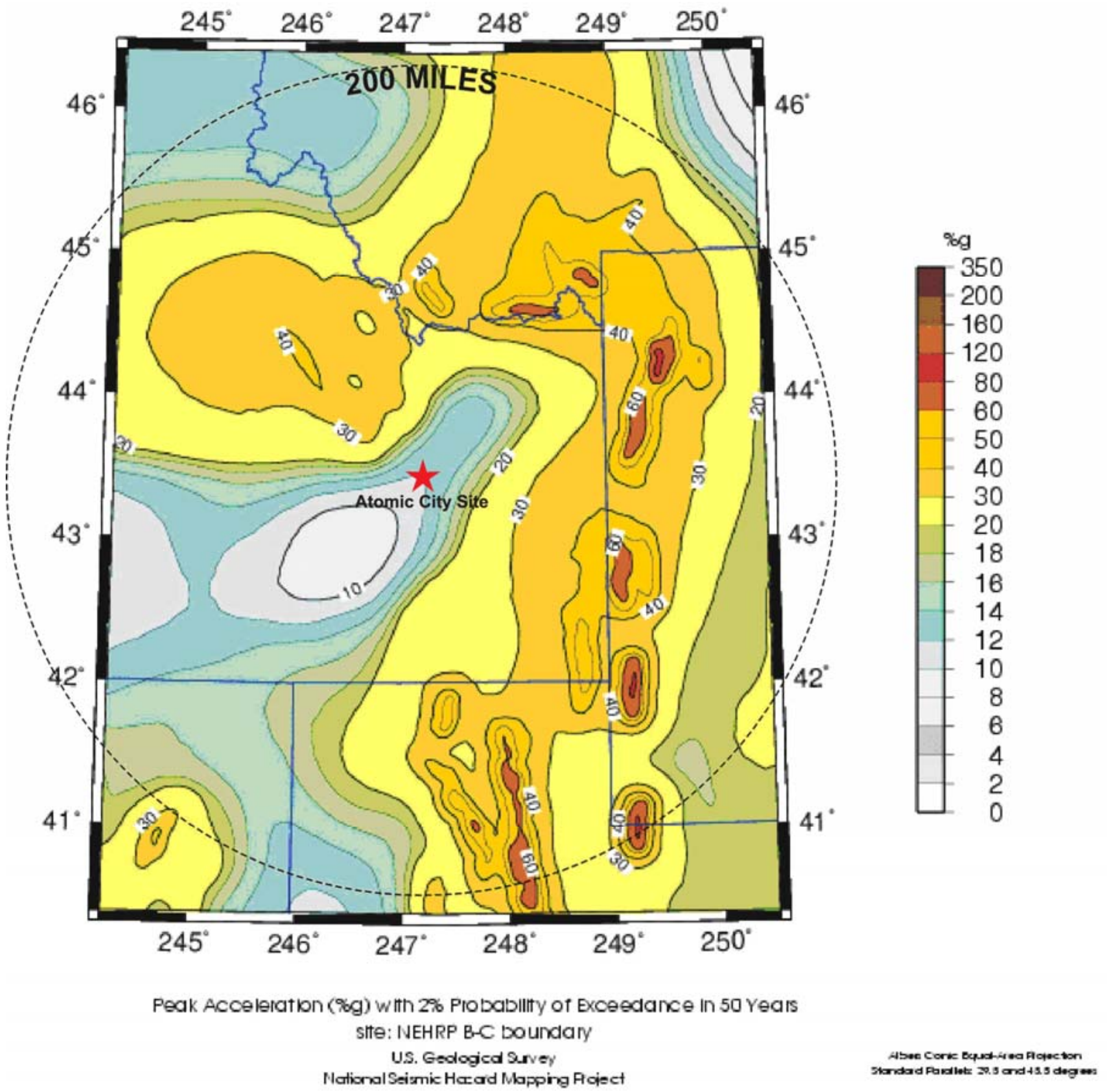

Figure 9-19. Predicted PGA for a 2 percent PE in 50 years (9-101, 9-102, 9-108).

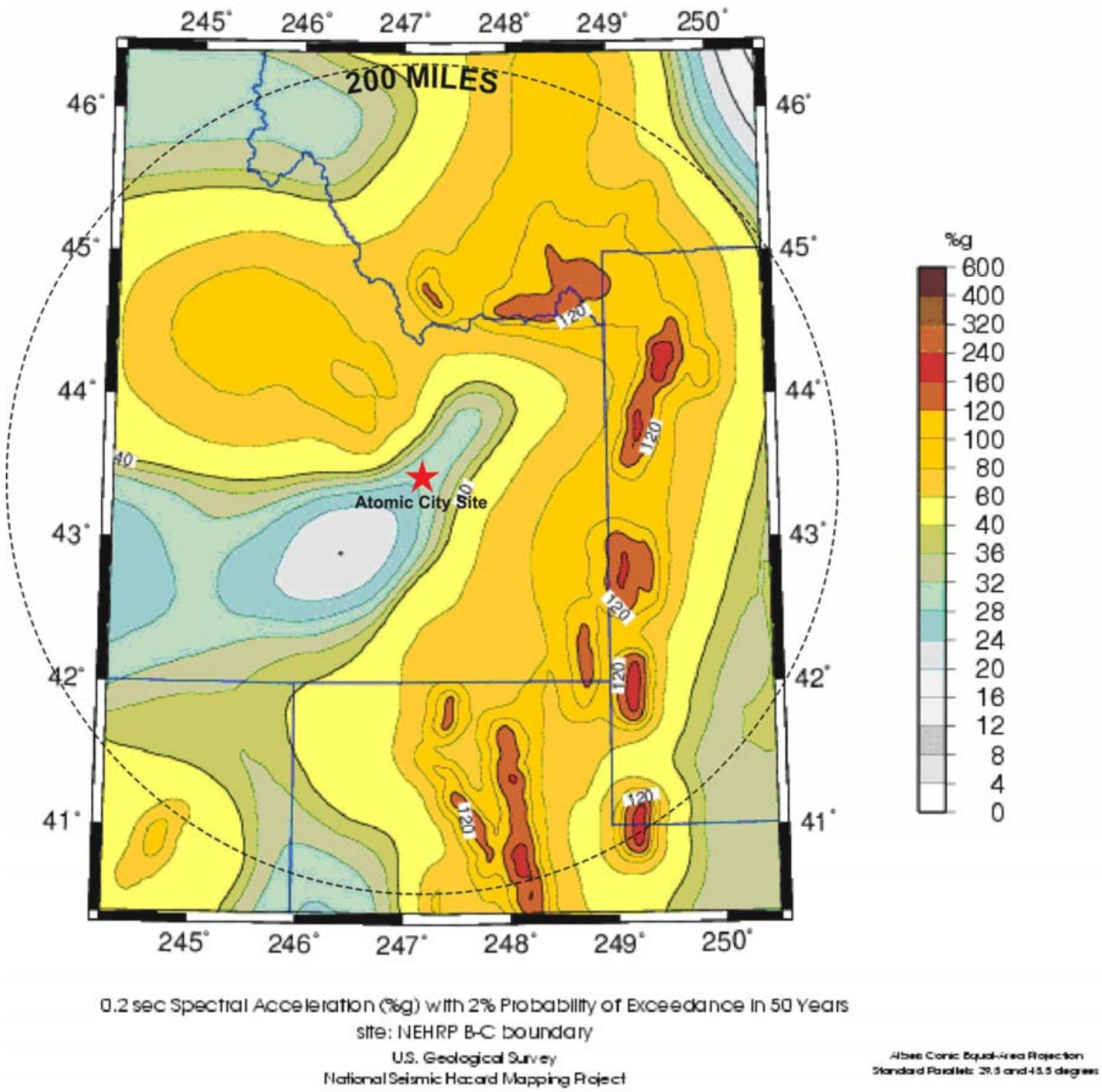

Figure 9-20. Predicted 0.2-second SA for a 2 percent PE in 50 years (9-101, 9-102, 9-108).

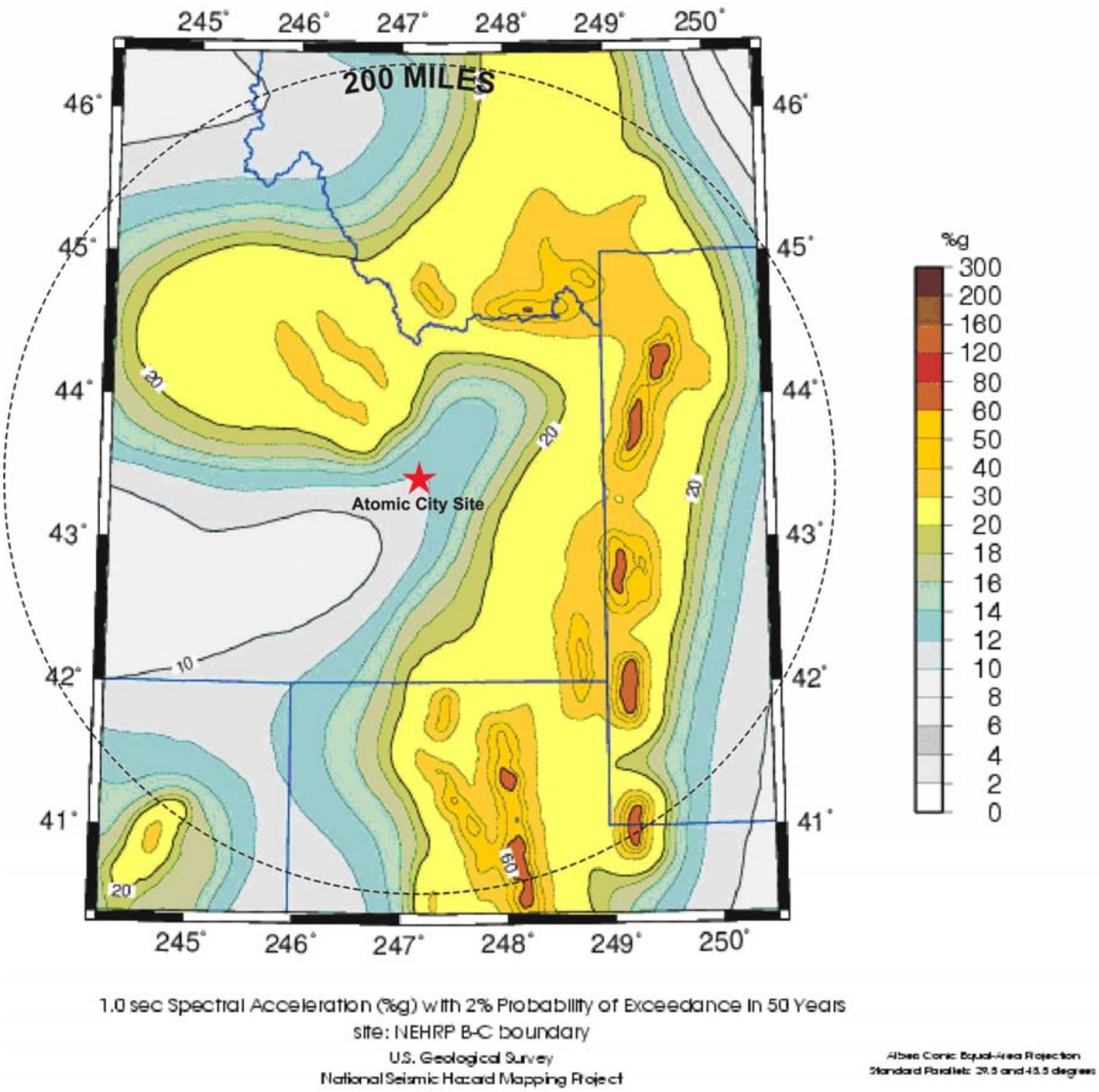

Figure 9-21. Predicted 1.0-second SA for a 2 percent PE in 50 years (9-101, 9-102, 9-108).

9.3.2 Surface Faulting

The purpose of the Surface Faulting investigation is to obtain information to determine whether and to what extent the GNEP facilities need to be designed for surface faulting (10 CRF 100 Appendix A). To satisfy the objectives of this investigation, NRC regulations require evaluation of capable faults greater than 1,000 feet long, any part of which is within 5 miles of the Atomic City site. The closest capable faults to the Atomic City site are the Howe section of the Lemhi fault at 25.5 miles to the north (9-081) and the Arco section of the Lost River fault at 28 miles to the northwest (9-084). At these distances, the faults are well beyond the 5-mile criterion given in 10 CFR 100 Appendix A (9-120) for faults requiring investigation and are not expected to affect the possible siting of nuclear facilities at the Atomic City site.

Since there are no capable faults within five miles of the Atomic City site, the following items requested in the scope of work for this project do not need to be addressed further relative to the 5-mile radius:

- Evaluation of fault capability,
- Listing of historical earthquakes,
- Correlation of epicenters of highest intensity to tectonic structures, and
- Characteristics of capable faults.

9.3.2.1 Geologic Setting

The geologic setting for the Atomic City site is described in Section 9.2. Specifically, Section 9.2.3.2 discusses local stratigraphy that is applicable to the area within 5 miles from the Atomic City site.

9.3.2.2 Tectonic Structures

There are no underlying tectonic structures with the potential for causing surface displacement at or near the Atomic City site. The closest structure within the ESRP is a network of fractures, tensional fissures, and fault-scarp-like features known as the Idaho volcanic rift system, associated with the intrusion of shallow igneous dikes in the underlying crust (9-077). This volcanic rift system is located approximately 28 miles to the southwest of the Atomic City site. Because of this distance, the Idaho volcanic rift system is not expected to affect siting of the proposed GNEP facilities.

9.3.2.3 Evidence of Fault Offset

There is no geologic evidence of fault offset at or near the ground surface in the vicinity of the Atomic City site. A series of linear and curvilinear lineaments located approximately 10 miles northeast of the Atomic City site near Middle and East Butte is visible on aerial photographs. This feature, known as the principal lineament, has been investigated several times since 1964 by trenching, mapping, geophysical studies, and soils and vegetation sampling. The conclusion reached by the investigators is that there is no evidence that the principal lineament is associated with faulting (9-050).

9.3.3 Seismically Induced Floods and Water Waves

No bodies of water of water occur in proximity to the site. The closest body of water is American Falls Reservoir, approximately 25 miles to the south. No potential exists at the Atomic City site for seismically induced floods and water waves.

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*Indicates those sources considered but not cited.

CONTENTS

FIGURES

TABLES

10. WEATHER / CLIMATE

This section describes weather and climatological conditions, and includes temperature, precipitation, and wind speed data (Sections 10.2 and 10.3); analyses of hurricane and tornado data (Section 10.4); and air quality studies (Section 10.5). Map base information is derived from maps in Section 1; any overlay data are indicated within the figure caption. The following information is presented for the Atomic City site:

- A general synopsis of state and site climatology, along with site-representative temperature, precipitation, and wind speed data.
- A storm study of hurricanes and tornadoes impacting the Atomic City site, including annual probability, maximum wind speed, tangential velocity, translational velocity, external pressure drop, site designation (with respect to hurricanes), and the number and intensity of tornados classified as Fujita Scale 2 or higher that have occurred recently within 1,000 square miles.
- Identification and description of air quality nonattainment and maintenance areas with respect to the National Ambient Air Quality Standards (NAAQS) for the areas within 80 kilometers (50 miles) of the Atomic City site and nearby population centers.

10.1 Overview and Summary

Climate, weather, and air quality conditions at the Atomic City site are summarized as follows:

- Local climate is continental and semi-arid.
- Topography in the area is not extreme and does not appear to have a major influence on local climate.
- Normal and extreme temperature and precipitation can be characterized by data from a weather station that is approximately 9 miles from the Atomic City site.
- Normal and extreme winds can be characterized by data from the Pocatello airport weather station.
- Normal daily average temperature ranges from 16.2°F in January to 69.2°F in July.
- Normal monthly precipitation ranges from 0.49 inch in January to 1.63 inch in May.
- Normal monthly windspeed ranges from 9.0 miles per hour in August to 11.8 miles per hour in April.
- Average annual temperature range is 26.8 to 57.1°F.
- Average annual precipitation (as rainfall equivalent) is 8.82 inches per year.
- Average annual windspeed is 10.1 miles per hour.
- Average annual prevailing wind direction is southwesterly (i.e. direction reported as 240°). Idaho has no instances of hurricanes.

- Idaho has no instances of hurricanes.

- Annual tornado probability within 1,000 square miles of the site is 0.08 tornadoes per year.

- One nonattainment area for the NAAQS for the pollutant Particulate Matter $(PM)_{10}$ has been identified within a 80-kilometer (50-mile) radius of the site. This area is located approximately 35 miles south. High PM_{10} concentrations have occurred in this area primarily from phosphate mining/mills activities.

10.2 Regional Meteorology

Idaho has two dominant climate types: a maritime climate most evident in the northern part of the state during the winter and a continental climate that prevails throughout the state during the summer (10-015). The northern maritime climate is characterized by higher moisture levels and precipitation during winter months and drier periods during the summer months. The climate of eastern Idaho is more continental and semi-arid than the west and north. It is characterized by a larger range between winter and summer temperatures with wetter summers and drier winters. The state's varied topography, ranging in elevation from 710 to 12,662 feet, also has a significant influence on local climates.

10.2.1 Temperature

Mean annual temperature at observing stations ranges from 55°F in the southwestern corner of the state to about 35°F in the central mountains. Mean monthly temperatures below 32°F generally occur from November through March at stations above 5,000 feet in elevation, from November through February at stations between 4,000 and 5,000 feet, from December through February for stations between 3,000 to 4,000 feet, and for only one or two months per year for stations between 2,000 to 3,000. For stations with the lowest elevations, there are no months in the year with a mean temperature below 32°F. Periods of extreme cold or extreme heat generally do not last for more than a week.

10.2.2 Precipitation

The primary source of moisture for Idaho's precipitation is the Pacific Ocean. In general, the northern and central highland areas receive more precipitation than the southern tier because of higher elevations and higher frequency of cyclonic activity in the north. Much of this area receives 30 to 50 inches of rainfall annually, with most occurring in the winter months when cyclonic activity is at its greatest. Much of the southern part of the state receives 20 inches or less of rainfall annually. The southwestern valley regions receive the least with less than 10 inches annually. These semi-arid conditions result from the Pacific moisture being effectively blocked by the Cascade and Sierra mountains to the west and the Bitterroot and Rocky Mountains to the north. On occasion, during the summer months, moisture from the Gulf of Mexico makes its way into the state, producing thunderstorms. Although these events are infrequent, they occur more often in eastern Idaho.

10.2.3 Winds

The prevailing upper-level winds across the state are generally from the west. Prevailing surface-level wind directions vary by location and are influenced by the orientation of valleys and mountain ranges.

10.3 Site-Specific Meteorology

Site-specific meteorological data are not available for the Atomic City site. However, climate data from nearby meteorological observing stations were used to represent climate conditions at the site. Table 10-1 lists the nearest stations managed by the National Weather Service (NWS) for which the most recent 30-year climate normals (i.e., 1971-2000) have been calculated by the National Climate Data Center (NCDC) (10-012, 10-021). The station locations relative to the site are shown in Figure 10-1. The Pocatello Regional Airport station is the closest first-order station to the site and is part of the Automated Surface Observing System (ASOS), which is the primary weather observing network in the U.S. First-order weather stations, which are generally located at major locations such as airports and military bases, record a complete range of meteorological parameters. The other stations in Table 10-1 are part of the NWS Cooperative Observer Program (COOP) a nationwide weather and climate monitoring network of 11,700 trained volunteer citizens and institutions observing and reporting weather information on a 24-hour basis. COOP observations form the backbone of temperature and precipitation records describing U.S. climate. First-order stations are also included as part of the COOP network, which is why the Pocatello station has a COOP identification number. All stations in Table 10-1 measure and record temperature and precipitation, but only the Pocatello station records wind speed and direction.

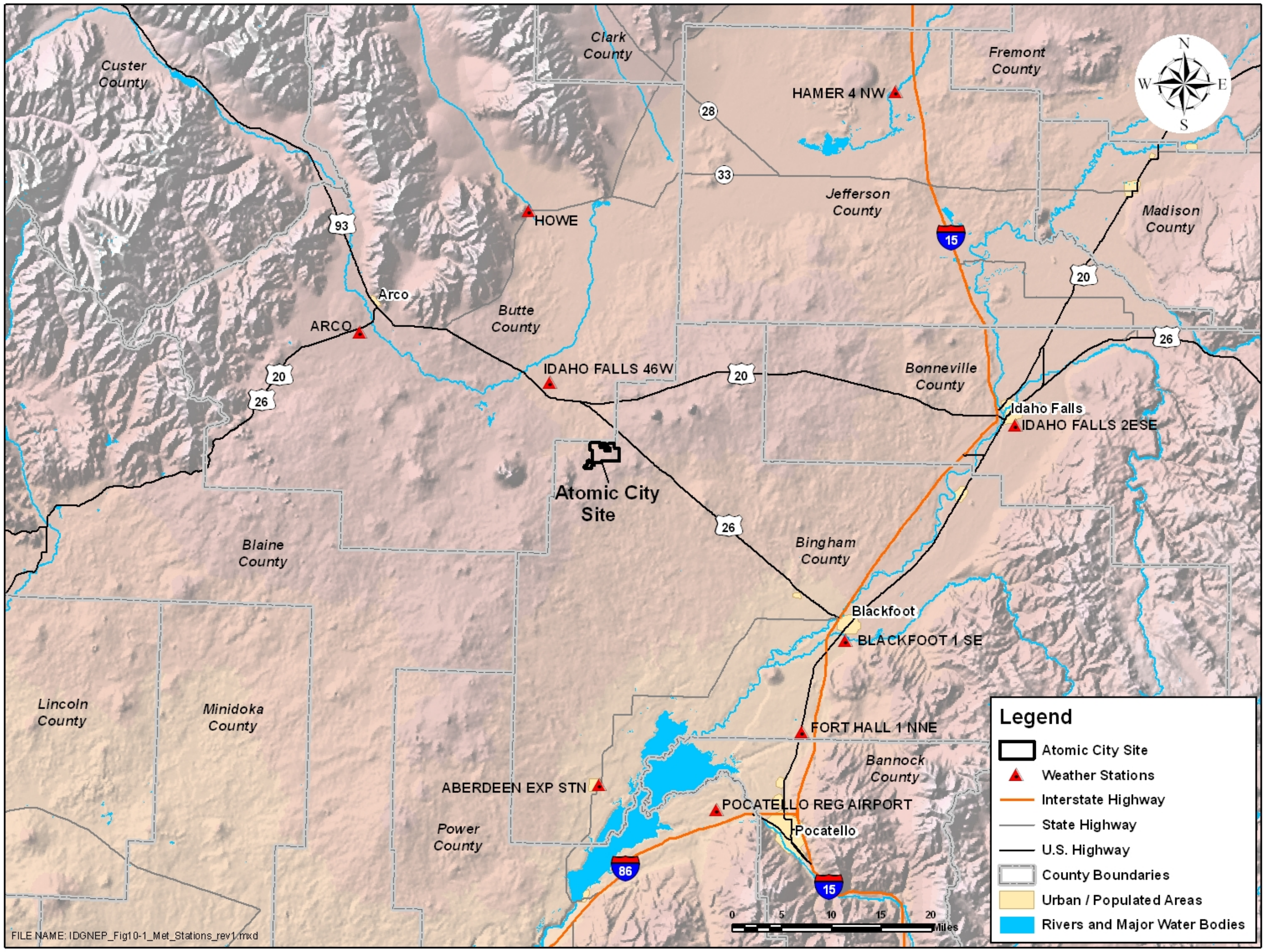

Figure 10-1. Nearest weather stations with 1971-2000 climate summaries (10-002, 10-003, 10-021).

Table 10-1. Weather stations in proximity to the Atomic City site and 1971-2000 climate summaries (10-012, 10-021).

Station Name	Station Type [(1)]	COOP ID [1]	WBAN ID [1]	Period of Record[2]	Lat / Long (deg:min)	Elevation (feet)[3]	Distance & Direction[4]
Pocatello Regional Airport	ASOS	107211	24156	1939 - present	42°55'/112°34'	4440	38 miles SSE
Fort Hall 1 NNE	COOP	103297	—	1948 - present	43°03'/112°25'	4465	34 miles SE
Blackfoot 1 SE	COOP	100915	—	1948 - present	43°11'/112°19'	4498	31 miles ESE
Idaho Falls 2 ESE	COOP	104455	—	1952 - present	43°29'/112°01'	4765	42 miles E
Hamer 4 NW	COOP	103964	—	1948 - present	43°58'/112°16'	4790	47 miles NE
Howe	COOP	104384	—	1948 - present	43°48'/113°00'	4820	27 miles NNW
Idaho Falls 46 W	COOP	104460	—	1954 - present	43°32'/112°57'	4938	9 miles NW
Arco	COOP	100375	—	1948 - present	43°38'/113°18'	5325	27 miles WNW
Aberdeen Experimental Station	COOP	100010	—	1914 - present	42°57'/112°50'	4405	33 miles S

[1]WBAN = a five-digit station identifier used at NCDC for digital data storage and general station identification purposes. WBAN is an acronym, invented in the 1950s, which stands for Weather-Bureau-Army-Navy.
[2]NCDC Monthly Station Climate Summaries (1971-2000) are available for this site.
[3]For comparison, the elevation at the Atomic City site is approximately 5,020 feet.
[4]Distance (miles) from the Atomic City site based on Atomic City site center coordinates of 43° 25' 52.9" N / 112° 50' 26.8" W.

These stations are distributed in an approximate circle surrounding the Atomic City site. The Idaho Falls 46 West station is nearest to the site both in terms of distance (9 miles) and elevation (approximately 5,000 feet) and should be most representative of the conditions at the site. However, climate normals and extremes for all these stations are given in Table 10-2 through Table 10-4 to represent the possible range of climate conditions in the region surrounding the site. Also, a review of the climate data in these tables reveals reasonable variability from station to station, especially with regard to rainfall. The topography in this area is characterized by the broad ESRP, large areas of old lava flows, and a scattering of small buttes. These topographic elements are not extreme and do not appear to have a major influence on local climate.

10.3.1 Temperature

Table 10-2 presents temperature data from nine meteorology stations near the Atomic City site (10-012, 10-014). The period of temperature record ranges from 30 to 63 years at these stations. At these stations, January is the coldest month and August is the warmest month. The normal daily temperatures in January range from lows of 4.4°F to 16.3°F to highs of 28.3°F to 32.5°F; in August, they range from lows of 45.5°F to 49.9°F to highs of 83.2°F to 86.8°F. The extreme recorded temperatures are a low of -48°F and a high of 105°F. From these tables, the station chosen to represent the Atomic City site (i.e., Idaho Falls 46 West) shows an annual average temperature range of 26.8 to 57.1°F. This station is located on the INL, approximately 9 miles northwest of the Atomic City site.

10.3.2 Precipitation

Table 10-3 presents precipitation data from nine meteorological stations near the Atomic City site (10-012, 10-014). The period of precipitation record ranges from 30 to 88 years at these stations. At these stations, monthly precipitation totals were generally highest during November-May, with highest normal precipitation during May. Extreme monthly precipitation was as high as 4.75 (Fort Hall 1 NNE) inches and as low as zero for multiple months at all stations. Normal annual precipitation ranged from 8.8 inches to 14.21 inches. The annual average rainfall for the Idaho Falls 46 West station, nearest to the Atomic City site, was 8.82 inches per year.

10.3.3 Winds

Wind data are available only from the Pocatello station (Table 10-4). The periods of record for average and extreme wind data were 43 and 54 years, respectively, at this station (10-001, 10-014). The highest average wind speed of 11.8 miles per hour occurred during April; the highest wind speed was 84 miles per hour. The prevailing wind direction was from the southwest (210 to 240°). Based on wind data at the Pocatello station, prevailing winds come from the southwest (i.e. direction reported as 240°), and the annual average wind speed is 10.1 miles per hour.

Table 10-2. Atomic City site climate: Normal and extreme temperatures (10-012, 10-014).

Station Name	Temperature (°F)	POR[1] (years)	Temperature Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Pocatello Regional Airport	Extreme High	63	57.0	65.0	75.0	86.0	93.0	103.0	104.0	104.0	98.0	91.0	75.0	64.0	104.0
	Normal High	30	32.5	39.0	48.5	58.5	67.7	78.3	87.5	86.8	75.7	62.0	44.5	33.8	59.6
	Average	30	24.4	30.0	37.9	45.6	53.5	62.0	69.2	68.4	58.8	47.7	34.7	25.3	46.5
	Normal Low	30	16.3	20.9	27.3	32.6	39.2	45.7	50.9	49.9	41.8	33.3	24.9	16.8	33.3
	Extreme Low	63	-31.0	-33.0	-12.0	12.0	20.0	28.0	34.0	30.0	19.0	10.0	-14.0	-29.0	-33.0
Fort Hall 1 NNE	Extreme High	54	58.0	66.0	76.0	86.0	93.0	100.0	103.0	103.0	98.0	90.0	74.0	63.0	103.0
	Normal High	30	31.1	37.5	47.4	57.2	66.1	75.6	84.2	84.1	74.2	61.4	43.6	32.4	57.9
	Average	30	22.2	27.6	36.1	43.9	52.0	60.0	66.5	65.6	56.6	45.7	32.8	23.0	44.3
	Normal Low	30	13.2	17.6	24.8	30.5	37.8	44.4	48.7	47.1	39.0	29.9	22.0	13.5	30.7
	Extreme Low	54	-34.0	-33.0	-12.0	11.0	17.0	25.0	32.0	29.0	14.0	8.0	-20.0	-30.0	-34.0
Blackfoot 1 SE	Extreme High	54	60.0	66.0	77.0	85.0	94.0	100.0	101.0	104.0	98.0	88.0	74.0	69.0	104.0
	Normal High	30	30.5	37.4	48.7	59.0	67.8	77.3	85.0	84.8	74.8	61.9	43.9	32.0	58.6
	Average	30	22.3	28.0	37.1	45.2	53.2	61.1	67.5	66.8	57.7	46.8	33.4	23.1	45.2
	Normal Low	30	14.0	18.6	25.5	31.4	38.5	44.9	50.0	48.7	40.5	31.6	22.9	14.2	31.7
	Extreme Low	54	-33.0	-35.0	-13.0	11.0	17.0	28.0	34.0	28.0	20.0	12.0	-16.0	-29.0	-35.0

Table 10-2. (continued).

Station Name	Temperature (°F)	POR[1] (years)	Temperature Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Idaho Falls 2 ESE	Extreme High	50	55.0	63.0	75.0	85.0	92.0	100.0	100.0	100.0	95.0	87.0	73.0	60.0	100.0
	Normal High	30	29.7	36.6	47.6	58.7	67.9	77.8	86.0	85.8	75.1	61.4	43.0	31.3	58.4
	Average	30	21.1	26.7	36.2	45.0	53.3	61.9	68.7	67.9	58.2	46.8	33.1	22.4	45.1
	Normal Low	30	12.5	16.8	24.8	31.3	38.7	46.0	51.4	49.9	41.3	32.2	23.2	13.4	31.8
	Extreme Low	50	-29.0	-34.0	-15.0	9.0	20.0	28.0	34.0	31.0	18.0	7.0	-12.0	-29.0	-34.0
Hamer 4 NW	Extreme High	54	55.0	58.0	74.0	86.0	91.0	102.0	105.0	102.0	97.0	88.0	70.0	60.0	105.0
	Normal High	30	28.3	35.0	47.0	59.9	69.3	78.8	87.0	85.9	75.6	62.0	41.9	29.6	58.4
	Average	30	16.4	22.5	33.5	43.8	53.1	61.3	67.5	65.7	55.9	44.2	29.0	17.5	42.5
	Normal Low	30	4.4	10.0	19.9	27.6	36.9	43.8	47.9	45.5	36.1	26.4	16.0	5.3	26.7
	Extreme Low	54	-48.0	-46.0	-27.0	6.0	14.0	25.0	28.0	20.0	10.0	2.0	-26.0	-40.0	-48.0
Howe	Extreme High	54	58.0	59.0	74.0	86.0	90.0	102.0	102.0	101.0	94.0	85.0	69.0	58.0	102.0
	Normal High	30	30.7	36.9	48.0	60.6	69.1	78.1	86.9	85.7	75.1	61.5	43.0	31.4	58.9
	Average	30	18.4	24.3	35.2	45.1	53.3	61.4	68.1	66.6	56.6	45.2	30.3	18.9	43.6
	Normal Low	48	51.0	60.0	73.0	86.0	91.0	100.0	101.0	101.0	96.0	87.0	67.0	57.0	101.0
	Extreme Low	54	-35.0	-38.0	-23.0	8.0	16.0	28.0	33.0	29.0	18.0	9.0	-22.0	-37.0	-38.0

Table 10-2. (continued).

Station Name	Temperature (°F)	POR[1] (years)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Idaho Falls 46 W	Extreme High	48	51.0	60.0	73.0	86.0	91.0	100.0	101.0	101.0	96.0	87.0	67.0	57.0	101.0
	Normal High	30	27.9	34.0	44.8	56.9	66.3	76.8	86.6	85.7	74.6	60.9	41.4	29.4	57.1
	Average	30	16.2	22.1	32.8	42.4	51.2	60.0	67.6	66.2	55.7	43.4	28.7	17.1	42.0
	Normal Low	30	4.5	10.2	20.7	27.9	36.1	43.2	48.5	46.7	36.8	25.9	15.9	4.8	26.8
	Extreme Low	48	-40.0	-36.0	-28.0	6.0	13.0	23.0	28.0	24.0	12.0	1.0	-24.0	-47.0	-47.0
Arco	Extreme High	54	52.0	59.0	71.0	86.0	90.0	97.0	102.0	100.0	96.0	83.0	69.0	59.0	102.0
	Normal High	30	29.5	35.5	45.7	58.1	67.0	76.6	84.6	83.2	73.6	61.1	41.9	30.4	57.3
	Average	30	17.2	22.6	33.2	43.5	51.8	60.0	66.5	65.1	55.8	45.1	29.8	18.3	42.4
	Normal Low	30	4.8	9.6	20.7	28.8	36.6	43.4	48.4	47.0	38.0	29.0	17.6	6.2	27.5
	Extreme Low	54	-35.0	-31.0	-19.0	5.0	11.0	21.0	29.0	25.0	15.0	8.0	-21.0	-45.0	-45.0
Aberdeen Experimental Station	Extreme High	88	56.0	63.0	76.0	86.0	96.0	103.0	104.0	103.0	98.0	89.0	76.0	67.0	104.0
	Normal High	30	31.0	37.1	47.3	57.9	66.9	76.3	85.0	85.1	74.7	62.0	44.2	32.9	58.4
	Average	30	21.4	26.7	35.9	44.0	52.5	60.6	67.1	65.9	56.2	45.3	32.5	22.6	44.2
	Normal Low	30	11.7	16.3	24.5	30.1	38.1	44.8	49.1	46.7	37.7	28.5	20.8	12.2	30.0
	Extreme Low	88	-42.0	-38.0	-24.0	-7.0	15.0	22.0	31.0	29.0	9.0	4.0	-16.0	-32.0	-42.0

[1]Period of Record (POR) identified in the reference documentation (see below) for use in determining climate conditions for this weather element.

Table 10-3. Atomic City site climate: Normal and extreme precipitation as rainfall (inches) (10-012, 10-014).

Station Name	Range	POR[1] (years)	Precipitation												
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Pocatello Regional Airport	Extreme High[2]	63	3.24	2.63	2.95	2.82	3.29	3.30	2.28	2.02	3.43	2.54	2.84	3.39	—
	Normal	30	1.14	1.01	1.38	1.18	1.51	0.91	0.70	0.66	0.89	0.97	1.13	1.10	12.58
	Extreme Low[2]	63	0.21	0.13	0.11	0.06	0.25	0.02	0	0	0	0	0.01	0.07	—
Fort Hall 1 NNE	Extreme High[2]	54	2.46	1.97	2.80	2.78	4.75	3.41	2.68	2.46	2.66	2.98	2.53	2.90	—
	Normal	30	0.94	0.91	1.17	1.08	1.63	1.00	0.68	0.77	0.84	1.06	0.99	0.95	12.02
	Extreme Low[2]	54	0.17	0.04	0.03	0.13	0.22	0.04	0	0	0	0	0	0.04	—
Blackfoot 1 SE	Extreme High[2]	54	2.29	2.08	3.21	2.34	3.92	4.04	2.51	1.72	2.64	2.40	2.16	2.61	—
	Normal	30	0.86	0.73	0.89	0.93	1.33	0.87	0.53	0.45	0.70	0.84	0.81	0.75	9.69
	Extreme Low[2]	54	0	0	0.03	0	0	0	0	0	0	0	0	0	—
Idaho Falls 2 ESE	Extreme High[2]	50	2.38	3.13	4.30	2.82	4.56	3.16	2.13	2.66	2.81	2.49	3.20	3.18	—
	Normal	30	1.25	1.01	1.33	1.27	2.01	1.18	0.74	0.93	0.94	1.12	1.17	1.26	14.21
	Extreme Low[2]	50	0.22	0	0.04	0.2	0.33	0.15	0	0.07	0	0	0	0	—

Table 10-3. (continued).

Station Name	Range	POR[1] (years)	Precipitation Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Hamer 4 NW	Extreme High[2]	54	1.93	1.61	1.77	2.29	4.21	2.91	2.98	1.65	2.20	2.20	1.69	1.51	—
	Normal	30	0.66	0.51	0.70	0.87	1.52	1.18	0.91	0.76	0.61	0.65	0.74	0.66	9.77
	Extreme Low[2]	54	0.01	0.02	0.05	0.09	0.13	0.25	0	0.04	0	0	0	0	—
Howe	Extreme High[2]	54	1.25	2.27	1.86	3.01	3.24	4.06	3.55	3.67	2.66	1.40	2.32	2.06	—
	Normal	30	0.49	0.62	0.58	0.60	1.10	1.11	0.74	0.77	0.53	0.56	0.65	0.68	8.43
	Extreme Low[2]	54	0	0	0	0	0.08	0	0	0	0	0	0	0	—
Idaho Falls 46 W	Extreme High[2]	48	1.20	2.36	2.03	1.99	2.34	4.64	2.29	1.13	2.08	1.67	1.74	1.91	—
	Normal	30	0.64	0.62	0.69	0.79	1.24	1.08	0.66	0.44	0.73	0.57	0.69	0.67	8.82
	Extreme Low[2]	48	0.01	0	0	0	0.31	0.01	0	0.02	0	0	0	0	—
Arco	Extreme High[2]	54	2.42	3.55	2.58	2.40	3.27	3.07	3.39	2.42	2.23	1.58	2.59	1.77	—
	Normal	30	0.82	1.05	0.86	0.75	1.32	0.90	0.83	0.78	0.70	0.63	0.80	0.81	10.25
	Extreme Low[2]	54	0	0.02	0	0	0.19	0	0	0	0	0	0	0.02	—
Aberdeen Experimental Station	Extreme High[2]	88	2.00	2.64	2.71	2.20	3.11	4.56	2.64	1.83	2.41	2.17	2.27	3.06	—
	Normal	30	0.74	0.72	0.86	0.75	1.12	0.92	0.56	0.53	0.77	0.84	0.73	0.70	9.24
	Extreme Low[2]	88	0.05	0.04	0	0	0.01	0.02	0	0	0	0	0	0.03	—

[1]POR identified in the reference documentation (see below) for use in determining climate conditions for this weather element.
[2]Precipitation extremes are provided in the NCDC Monthly Station Climate Summaries for maximum in 24-hours, maximum monthly, and minimum monthly. Maximum and minimum annuals are not provided.

Table 10-4. Atomic City site climate: extreme and average wind speed (miles per hour) and prevailing wind direction (tens of degrees) (10-001, 10-014).

Station Name	Wind	POR[1] (years)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Pocatello Regional Airport[2]	Extreme High	54	61	59	72	61	61	84	57	67	57	58	67	61	84
	Average	43	9.8	10.5	11.4	11.8	10.7	10.2	9.4	9.0	9.0	9.6	10.2	9.9	10.1
	Direction[3]	27	240	240	240	240	240	240	210	240	240	240	240	240	240

[1]POR identified in the reference documentation for use in determining climate conditions for this weather element.
[2]Wind data are available only for the Pocatello station.
[3]Wind direction is recorded in degrees clockwise from true North. "00" indicates calm. "360" indicates true North.

10.4 Extreme Weather

Severe weather includes tornadoes, large hail, and strong winds. Idaho has no instances of hurricanes or destructive winds associated with tropical storms. However, the entire state averages two to three tornadoes per year, most commonly across the eastern Plains (10-018), ranking Idaho as the 36th in the nation in terms of tornado incidence statewide and 43rd in terms of tornado incidence per square mile (10-013, 10-023) . While tornadoes are rare in Idaho, windstorms associated with cold front passages are more common and generally cause only minor structure damage. Windstorms occur primarily between October and July. Thunderstorms in the summer months can also cause strong winds, small hail, and an extremely low incidence of tornadoes with very little reported damage. When there is damage, it is usually to crops and on a very small scale.

Damage from excessive precipitation, lightning, hail, or high winds associated with summer thunderstorms is uncommon and very localized. While thunderstorms can occur anywhere within the state, the lack of low-level moisture, thermal uplift, and instability effectively limit convective potential and the occurrence of severe thunderstorms. Because few of these storms become severe, there is an extremely low incidence of tornadoes, averaging only two to three per year. Detailed analyses of hurricanes and tornados relative to the Atomic City site location are presented below.

10.4.1 Hurricanes

A hurricane is a severe tropical storm that forms in the warm waters of the North Atlantic Ocean, Gulf of Mexico, or Northeast Pacific Ocean. In order to be sustained, hurricanes need warm tropical oceans, moisture at low levels in the atmosphere, and light winds in the upper atmosphere above them. Under the right conditions, a hurricane is capable of producing violent winds, large waves, torrential rains, and floods. While over the ocean, hurricanes generally do not pose a threat. It is not until these storms approach the coastline and move inland that their impact on human interests is felt. Once over land, the severe high winds tend to subside quickly and the threat shifts to heavy rain and flooding.

Two sources of information are available for evaluating U.S. hurricane strike probabilities and historical hurricane tracks:

- The U.S. Landfalling Hurricane Probability Project, conducted by Colorado State University in 2004, calculated probabilities of landfalling tropical cyclones along the U.S. coastline from Brownsville, Texas to Eastport, Maine (10-016).

- Historical Hurricane Tracks, interactive website tool supported by the NOAA Coastal Services Center that displays Atlantic Basin and East-Central Pacific Basin tropical cyclone data (10-022).

Because Idaho is an inland state that does not border on any major coastline, the landfall probabilities presented by the U.S. Landfalling Hurricane Probability Project cannot be applied to the Atomic City site. The nearest study area in the project (i.e., the Texas coastline) is located more than 1,400 miles from the site.

Although inland states cannot directly experience a landfalling hurricane, these states can still be affected by hurricanes that move inland. The intensity of any hurricane moving over land will quickly diminish as it encounters friction and loses low-level support of tropical moisture and warm ocean waters. A hurricane will be downgraded to tropical storm, tropical depression, or extra-tropical low pressure system as it continues to lose strength. Heavy rains and flooding under the storm remnants may persist for days after landfall, and may occur hundreds of miles inland.

Historically, tropical storms have never been reported in the state of Idaho. Figure 10-2 presents results of the Historical Hurricane Tracks website tool that was queried to show tracks of all tropical storms that have crossed into the western U.S. since records have been kept (since 1851 for Atlantic storms and since 1949 for Pacific storms). No recorded track brought the center of a tropical storm closer than 400 miles from the Atomic City site. Based on this analysis of storm tracks, the Atomic City site has never experienced tropical-force winds associated with a storm classified as tropical.

10.4.2 Tornadoes

According to the American Meteorological Society (AMS) Glossary of Meteorology, a tornado is "a violently rotating column of air, pendant from a cumuliform cloud or underneath a cumuliform cloud, and often (but not always) visible as a funnel cloud." In order for a vortex to be classified as a tornado, it must be in contact with the ground and the cloud base (10-011).

Intensities of tornadoes occurring in the U.S. have been estimated using the original Fujita Scale, or F-scale, which ranks tornadoes based on the level of observable damage, F0 being the weakest and F5 the strongest. An enhanced version of the F-scale was implemented in February 2007. Both F-scales are presented in Table 10-5 and relate observed damage to estimated wind speed (10-019).

Table 10-5. Fujita Tornado Scales (10-019).

Original Fujita Scale			**Enhanced Fujita Scale**		
Scale Value	**Fastest 1/4-mile (miles per hour)**	**3-second Gust (miles per hour)**	**Scale Value**	**3-second Gust (miles per hour)**	**Structural Damage Description**
F0	40-72	45-78	EF0	65-85	Little Damage
F1	73-112	79-117	EF1	86-110	Minor Damage
F2	113-157	118-161	EF2	111-135	Roof Gone
F3	158-206	162-209	EF3	136-165	Walls Collapse
F4	207-260	210-261	EF4	166-200	Blown Down
F5	261-318	262-317	EF5	>200	Blown Away

Direct wind speed and pressure drop measurements within tornadoes are not possible or practical because only a handful of known cases exist where weather instruments have survived a direct hit by a tornado (10-011). The Enhanced F-scale uses 3-second gust estimates at the point of damage based on eight levels of damage using 28 indicators. The “fastest ¼ mile” and the “3-second gust” cannot be equated to standard surface wind observations of peak wind, which are based on 5-second and 2-minute averages. These different statistical measures of wind speed presented in the F-scales are not intended to be compared against one another. Instead, each provides a basis for correlating wind loading to observed tornado damage.

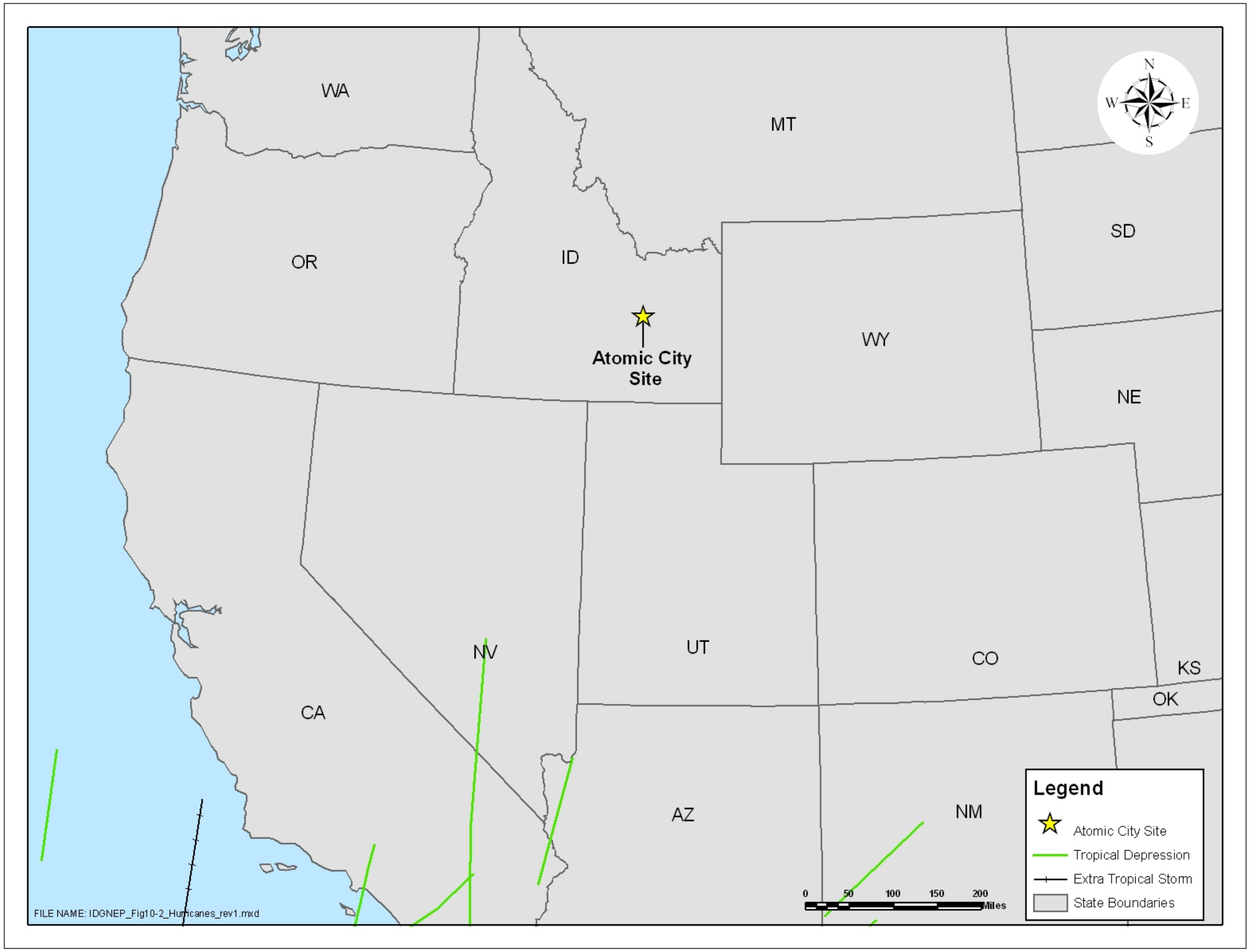

Figure 10-2. Historical hurricane tracks (10-022).

The average probability of tornado occurrence within the entire state of Idaho is two to three per year (10-018). With a total area covering 82,747 square miles, Idaho's annual average probability of a tornado occurring within any 1,000 square mile area can be approximated as:

State-wide Annual Average Tornado Probability

$$\frac{2.5\ tornadoes\ \ per\ \ year}{82{,}747\ sq\ mi} = \frac{0.03\ tornadoes\ \ per\ \ year}{1{,}000\ sq\ mi}$$

Although this ratio is an oversimplification because it assumes an even distribution of tornadoes within the state, the overall low frequency is an indication that the likelihood of a tornado occurring within any locality is very small. Observations of 159 reported tornadoes in Idaho from 1880 through 2000 indicate that 93 percent were classified as weak (F0 or F1) and 7 percent were classified as strong (F2 or F3) (10-025).

Detailed information on tornado events that have occurred on or near the Atomic City site was obtained from:

- *The NCDCs Storm Event Database,* which is a publicly available on-line storm event database that has search capabilities based on location, time period, and storm type. Event summaries and details are available by state, county, time period, and event type. At the time of access, the database contained reported storm events from January 1, 1950 through October 31, 2006 (10-013).

To better evaluate the probability of tornado occurrence in southeastern Idaho at the location of the Atomic City site, several queries of the Storm Event Database were performed for tornado events:

- Statewide for the period 01/01/1950 – 10/31/2006, in order to verify the completeness of the Storm Events Database by comparing these results to the climatological state-wide annual average.

- Counties surrounding the Atomic City site (i.e., Bingham, Blaine, Bonneville, Butte, and Jefferson Counties) for the period 01/01/1950 – 10/31/2006, in order to define annual average tornado probability for this site, since severe weather occurs more frequently in the southeastern part of Idaho.

- Counties surrounding the Atomic City site (i.e., Bingham, Blaine, Bonneville, Butte, and Jefferson Counties) for the period 11/01/2001 – 10/31/2006, in order to assess tornado occurrences within 1,000 square miles of the Atomic City site over the past 5 years.

The first two queries, presented in Table 10.6, show that a total of 175 tornadoes were reported statewide over the past 57 years for an average of 3.07 tornadoes per year. This closely matches the climatological average of 2 to 3 per year. The five counties surrounding the Atomic City site account, on average, for 0.81 tornadoes per year. In other words, 26 percent of the tornadoes, on average, occur within 12 percent of the state's land area surrounding the site. This is consistent with the statement that severe weather is more common in the southeastern part of the state.

Based on the data for Bingham, Blaine, Bonneville, Butte, and Jefferson Counties, as opposed to state-wide data used in the calculation presented earlier in this section, the average annual probability of a tornado occurring within any 1,000 square mile area in the vicinity of the Atomic City site can be approximated as:

Bingham/Blaine/Bonneville/Butte/Jefferson County Annual Average Tornado Probability

$$\frac{0.81 \text{ tornadoes per year}}{9{,}933 \text{ sq mi}} = \frac{0.08 \text{ tornadoes per year}}{1{,}000 \text{ sq mi}}$$

Table 10-6. Number of tornadoes (1950-2006) by location and F-scale intensity (10-013).

Idaho Location	Area Coverage (square miles)	Number of Tornadoes (1950–2006) by F-Scale Intensity[1]						Annual Probability of Occurrence Tornadoes per Year[2]					
		F0	F1	F2	F3	F4	Total	F0	F1	F2	F3	F4	Total
Statewide	82,747	104	61	10	—	—	175	1.82	1.07	0.18	—	—	3.07
5 County Area	9,933	23	22	1	—	—	46	0.40	0.39	0.02	—	—	0.81
Individual Counties													
Bingham	2,094	8	9	—	—	—	17	0.14	0.16	—	—	—	0.30
Blaine County	2,644	5	—	—	—	—	5	0.09	—	—	—	—	0.09
Bonneville County	1,868	2	2	1	—	—	5	0.04	0.04	0.02	—	—	0.09
Butte County	2,232	4	2	—	—	—	6	0.07	0.04	—	—	—	0.11
Jefferson County	1,095	4	9	—	—	—	13	0.07	0.16	—	—	—	0.23

[1]Tornadoes reported within the past 57 years (1950 – 2006).
[2]Annual probability determined as the "Number of Tornadoes (1950 – 2006)" / 57 years.

The Storm Event Database query for tornadoes that have occurred near the Atomic City site within the past 5 years used the following query parameters:

- State = Idaho
- Start Date = 11/01/2001
- End Date = 10/31/2006
- County = Bingham, Blaine, Bonneville, Butte, and Jefferson
- Event Type = Tornado

Results from this query are presented in Table 10-7. One requirement of this document is to identify F2 or stronger tornados that have occurred within 1,000 square miles of the Atomic City site over the past 5 years. This area can be described as the circular area centered on the facility and having a radius of 18 miles (diameter of 36 miles). While the time period requirement was a selectable item in the query, the specific spatial requirement was not. Instead, the query was set to return information for all counties that fall within the 18-mile radius circular area. Tornado locations returned in the query are shown on Figure 10-3. No F2 or stronger tornadoes were reported within the surrounding counties and no tornadoes of any intensity were reported within the 1,000 square miles around the site in the past 5 years.

Table 10-7. Tornadoes reported in the past 5 years within Bingham, Blaine, Bonneville, Butte, and Jefferson counties, Idaho (10-013).

Idaho County	Tornado ID	Date[1]	Intensity	Starting Latitude / Longitude	Ending Latitude / Longitude	Path Length (miles)
Bingham	Shelley	05/28/2005	F0	43°20'/ 112°04'	43°20' / 112°05'	0
Bingham	Blackfoot	03/25/2006	F0	43°11'/ 112°21'	43°11' / 112°21'	2
Blaine	Carey 1	05/05/2005	F0	43°17'/ 114°00'	43°17' / 114°00'	1
Blaine	Carey 2	05/05/2005	F0	43°18'/ 113°57'	43°18' / 113°57'	0
Bonneville	<None>-	—	—	—	—	—
Butte	<None>	—	—	—	—	—
Jefferson	Roberts	06/01/2002	F1	43°42'/ 112°09'	43°44' / 112°06'	3
Jefferson	Terreton	06/04/2005	F0	43°50'/ 112°28'	43°50' / 112°28'	0
Jefferson	Monteview	04/04/2006	F0	43°53'/ 112°36'	43°53' / 112°36'	0

[1]Tornadoes reported within the past 5 years (Nov 2001 – Oct 2006).

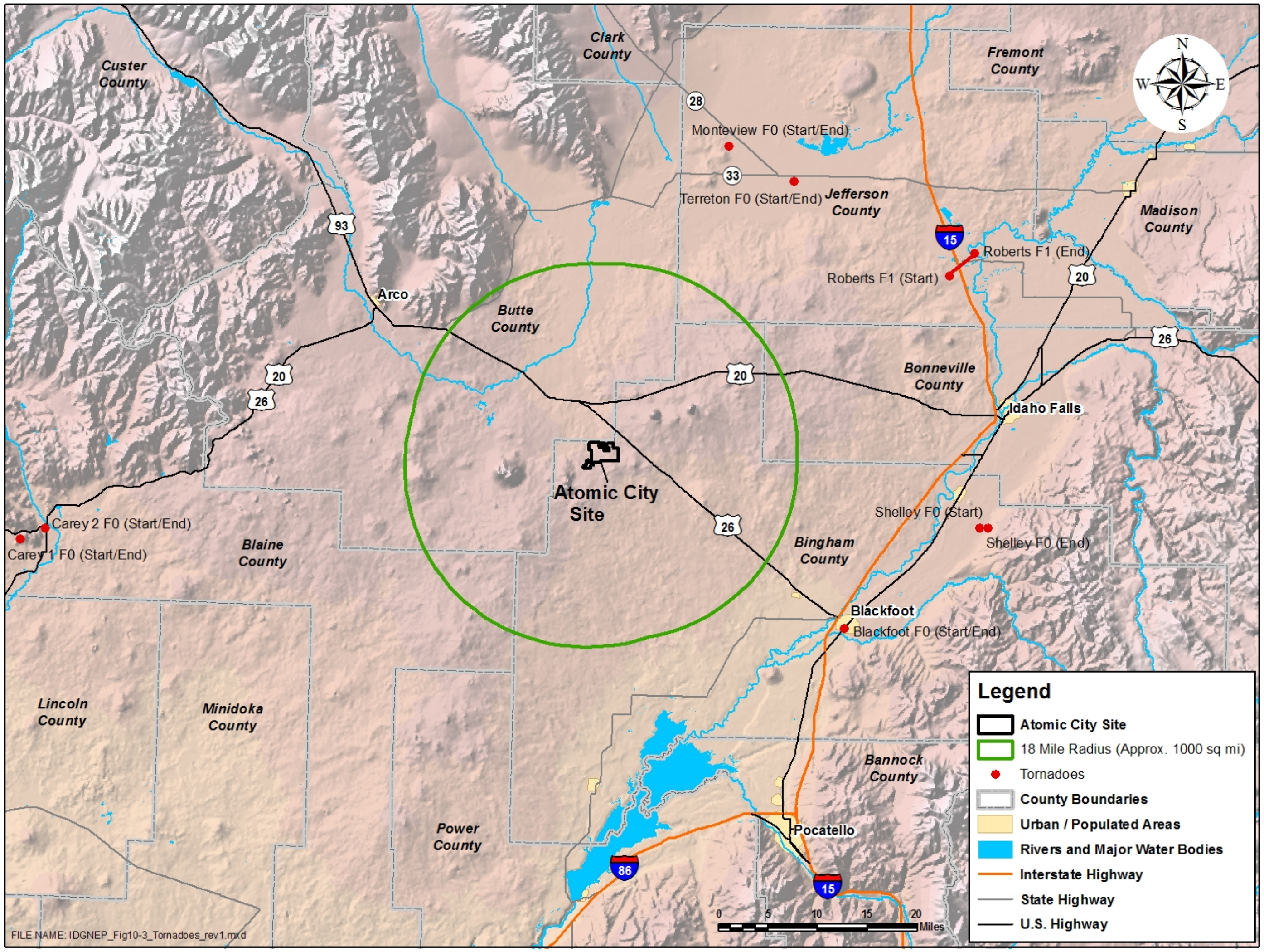

Figure 10-3. Tornadoes reported in the past 5 years (10-013).

10.5 Air Quality

The Clean Air Act (CAA), which was last amended in 1990, requires the EPA to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment (10-026).

10.5.1 Air Quality Standards

The EPA Office of Air Quality Planning and Standards has set NAAQS for six principal pollutants that are called "criteria" pollutants (see Table 10-8). Units of measure for the standards are presented as either parts per million (ppm) by volume, milligrams per cubic meter of air (mg/m^3), or micrograms per cubic meter of air ($\mu g/m^3$). The NAAQS are maximum concentrations measured in terms of local concentration of a pollutant in the atmosphere, above which adverse effects on human health may occur.

There are two types of standards: primary and secondary. Primary standards were established to protect public health, including the health of "sensitive" populations, such as asthmatics, children, and the elderly. Secondary standards were established to protect public welfare, including protection against decreased visibility, damage to animals, vegetation, and buildings. Idaho has adopted the NAAQS in the Rules for the Control of Air Pollution in Idaho IDAPA 58.01.01.575-587 (10-030).

Table 10-8. National Ambient Air Quality Standards (10-026, 10-027).

Criteria Pollutant	Averaging Time	Standard Value	Standard Type
Carbon Monoxide (CO)	8-hour	9 ppm ($10 mg/m^3$)	Primary
	1-hour	35 ppm ($40 mg/m^3$)	Primary
Nitrogen Dioxide (NO_2)	Annual (arithmetic mean)	0.053 ppm ($100 \mu g/m^3$)	Primary & Secondary
Lead (Pb)	Quarterly Average	1.5 $\mu g/m^3$	Primary & Secondary
Ozone (O_3)	8-hour	0.08 ppm	Primary & Secondary
	1-hour (applies in limited areas)	0.12 ppm	Primary & Secondary
Particulate Matter (PM_{10})	Annual (arithmetic mean)	Revoked	-
	24-hour	150 $\mu g/m^3$	Primary & Secondary
Particulate Matter ($PM_{2.5}$)	Annual (arithmetic mean)	15 $\mu g/m^3$	Primary & Secondary
	24-hour	35 $\mu g/m^3$	Primary & Secondary

Table 10-8. (continued).

Criteria Pollutant	Averaging Time	Standard Value	Standard Type
Sulfur Dioxide (SO_2)	Annual (arithmetic mean)	0.030 ppm (80 μg/m^3)	Primary
	24-hour	0.14 ppm (365 μg/m^3)	Primary
	3-hour	0.50 ppm (1300 μg/m^3)	Secondary

PM_{10} = particulate matter less than or equal to 10 microns in diameter.
$PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter.

10.5.1.1 The Idaho Department of Environmental Quality and Ambient Air Monitoring Data

When the CAA was originally developed, the criteria pollutants were identified and air quality standards were established for these pollutants. Under the CAA, individual states were required to develop a State Implementation Plan (SIP) to define the strategy for assessing and maintaining these established air quality standards. There are many different sources of the criteria air pollutants that affect regional air quality. These include man-made emissions from industrial sources, mobile sources, land clearing, and residential sources, as well as natural sources (e.g., trees). Since all of these must be considered in an assessment of air quality, EPA has identified ambient air monitoring as the proper method for assessment.

As part of its air quality assessment program, IDEQ maintains an ambient air monitoring network within the State of Idaho. Monitoring sites are located at more than 20 locations throughout the state. In addition, integrated sampling methods are used at another 10 sites (10-027). The data collected from these monitoring sites are used primarily to define the nature and level of pollution in the State of Idaho, determine which areas are meeting the air quality standards, and identify pollution trends in the state. The IDEQ monitoring network currently measures the levels of five of the six criteria pollutants:

- Particulate Matter (PM_{10} and $PM_{2.5}$),
- Carbon monoxide,
- Nitrogen dioxide,
- Sulfur dioxide, and
- Ozone.

Monitoring of airborne lead ended in 2002; it is no longer considered a major health threat in most of the United States because of the phase-out of leaded gasoline.

10.5.1.2 Current Air Quality Status: Attainment versus Nonattainment

The CAA also requires that the EPA assign a designation to each area of the U.S. regarding compliance with the NAAQS. The level of compliance or noncompliance is categorized by EPA as follows:

- Attainment – Currently meets NAAQS
- Maintenance – Currently meets NAAQS, but was previously out of compliance
- Nonattainment – Currently does not meet NAAQS.

Generally, nonattainment areas are required to submit a SIP documenting how compliance with the NAAQS will be achieved. The EPA, however, is providing the option to States to prepare and submit an Early Action Implementation Plan and thus be granted a reclassification deferral by a certain deadline dependent on the type of pollutant, by which date, the standard will be attained or the area will be designated as nonattainment.

States continuously work towards achieving attainment with state and federal air quality standards for several reasons:

- Achievement of compliance helps protect public health,
- Compliance contributes to economic growth,
- Nonattainment status can potentially limit production capabilities of existing industries and limit the installation of new industrial facilities,
- Attainment of the air quality standards also helps to avoid the potential loss of federal highway funding that can result from nonattainment status, and
- Development and implementation of plans to retain attainment can be time-consuming and costly.

10.5.2 Non-attainment Areas

Presently, four areas in Idaho are classified as being nonattainment areas (see Table 10-9). These four geographical nonattainment areas are shown on Figure 10-4. All other areas in Idaho are classified as currently meeting NAAQS for all criteria pollutants.

Table 10-9. Idaho nonattainment areas (10-027).

Area	Description	Pollutant	Background
Sandpoint	Located in Bonner County on the northwest corner of Lake Pend Orielle within the Panhandle National Forest.	PM_{10}	The topography influences much of the PM buildup in the area. In 1997, the area was designated moderate PM_{10} nonattainment, and an emissions inventory identified the primary PM_{10} source as residential wood burning. Fugitive road dust and some industrial sources are also considered significant contributors.
Pinehurst	Located in Shoshone County in the Silver Valley surrounded by the Coeur d'Alene and St. Joe National Forests.	PM_{10}	The area's topography is a significant factor in the buildup of pollutants that result in poor air quality. The emission inventory identified residential wood burning as the primary PM_{10} source and fugitive road dust as a secondary source.
Portneuf Valley	96.6 square miles of Pocatello, Chubbuck, and surrounding areas	PM_{10}	Formerly the Power/Bannock County PM_{10} area; split into Portneuf Valley and federal Fort Hall PM_{10} areas. Includes federal land managed by the BLM and the Caribou National Forest, as well as privately owned land in the cities of Pocatello and Chubbuck.
Northern Ada County	Southwestern Idaho	Carbon Monoxide	At present, Northern Ada County is a Limited Maintenance Area. Northern Ada County is Idaho's only designated carbon monoxide Maintenance Area. Mobile and area source emissions are the two major sources of carbon monoxide.

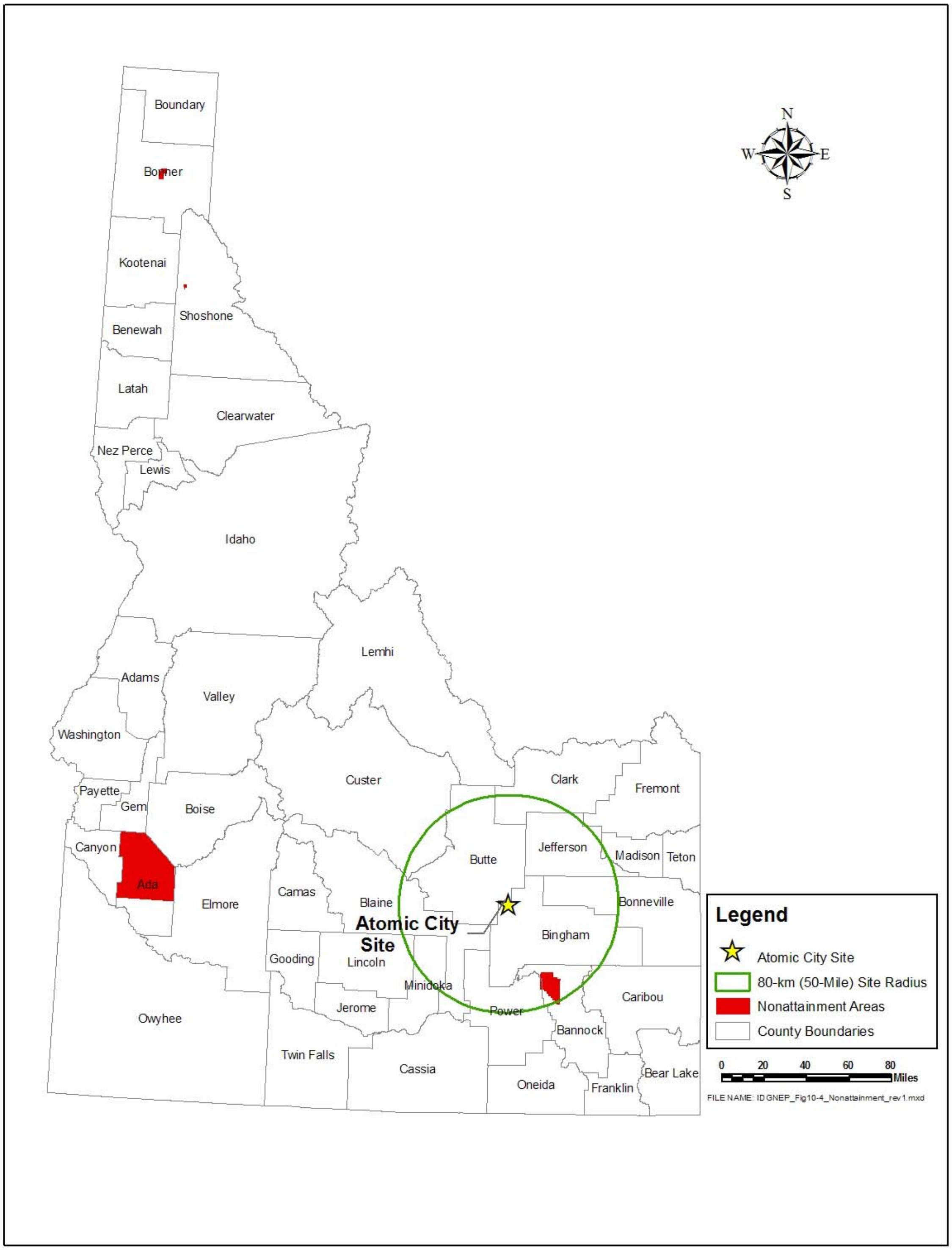

Figure 10-4. Idaho air-quality nonattainment areas (10-027).

Only one nonattainment area lies within a 50-mile radius for the Atomic City site. This is the 96.6 square mile Portneuf Valley Nonattainment Area (PVNA) in Bannock County (see Figure 10-4). This nonattainment area is approximately 35 miles south of the site and includes federal land managed by the BLM and the Caribou National Forest as well as privately owned land in the cities of Pocatello and Chubbuck.

The pollutant for which the PVNA has been designated as nonattainment is PM_{10}, which is particulate matter less than or equal to 10 microns in diameter. The primary source of this pollutant is phosphate mining and phosphate mills. Some secondary sources are residential wood burning and fugitive road dust.

The probable residential areas for workers within 50 miles of the Atomic City site along with probable commuter routes are provided in Table 10-10. These areas are listed according to population, from highest to lowest. In addition, straight line distances are given from nearby cities and towns to the Atomic City site and the PVNA. Two cities are located within the PVNA.

Table 10-10. Possible workers resident locations and commuter routes (10-028).

City/Town[1]	**Population**[2]	**Distance to Atomic City Site**[3] **(miles)**	**Distance to Portneuf Valley Nonattainment Area (miles)**	**Probable Commuter Route to Atomic City Site**
Pocatello	51,466	43	Located within this area	Interstate 15-N to Highway 26-W to Atomic City site
Idaho Falls	50,730	39	41	Highway 20-W to Highway 26-E to Atomic City site
Blackfoot	10,419	28	16	Highway 26-W to Atomic City proposed Site
Chubbuck	9,700	39	Located within this area	Interstate 15-N to Highway 26-W to Atomic City site
American Falls	4,111	44	16	Interstate 86-E to Interstate 15-N to Highway 26-W to Atomic City site
Shelley	3,813	36	31	Highway 91-S to Highway 26-W to Atomic City site
Fort Hall	3,193	35	5	Highway 91-N to Highway 26-W to Atomic City site
Aberdeen	1,840	33	16	Route 39-N to Highway 26-W to Atomic City site
Arco	1,026	26	61	Highway 20-E to Highway 26-E to Atomic City site

Table 10-10. (continued).

City/Town[1]	Population[2]	Distance to Atomic City Site[3] (miles)	Distance to Portneuf Valley Nonattainment Area (miles)	Probable Commuter Route to Atomic City Site
Roberts	647	39	55	Interstate 15-S to Highway 20-W to Highway 26-E to Atomic City site
Mackay	566	50	86	Highway 93-S to Highway 20-E to Highway 26-E to Atomic City site
Firth	408	33	26	Highway 91-S to Highway 26-W to Atomic City site
Mud Lake	270	33	62	Route 33-W to Highway 20-E to Highway 26-E to Atomic City site
Atomic City	25	—	37	—
Hamer	12	46	69	Interstate 15-S to Highway 20-W to Highway 26-E to Atomic City site
Howe	(not listed)[4]	25	62	Route 33-W to Highway 20-E to Highway 26-E to Atomic City site

1 Cities and towns within 50 miles of the Atomic City site.
2 Population from 2000 U.S. Census.
3 Straight line distance does not represent miles traveled along probable commuter route.
4 The population for the town of Howe in Butte County is not listed in the reference document. The population for the entire Butte County is 2,899. The only other towns listed in the reference document for this County are Arco (population 1,026), Butte City (population 76), and Moore (population 196)

10.5.3 Meteorological Conditions During High PM_{10} Events – Portneuf Valley Nonattainment Area

The meteorological conditions typically associated with poor air quality in the PVNA are described in the Maintenance Plan and Redesignation Request document prepared in 2004 by the IDEQ (10-029). Ambient air monitoring has shown that this area attained the PM_{10} NAAQS on December 31, 1996. Since this date, the area has been in compliance with the NAAQS. This document presents the necessary evidence and analysis for the EPA to formally redesignate the PVNA. To date, the EPA has not yet acted on this request. As such, the current designation of nonattainment remains in effect.

Local meteorological conditions play a significant role during episodes of high 24-hour PM_{10} concentrations in the PVNA. This includes conditions that enhance particulate emissions from fugitive dust sources, reduce atmospheric dispersion, and favor the formation of secondary aerosols. Data collected in the PVNA during episodes of high 24-hour PM_{10} concentrations at ambient monitoring sites suggest these episodes are usually associated with the following weather events and/or human activities (10-029):

- Regional high-wind events associated with the passage of strong frontal systems during the spring and autumn result in wind-blown dust events affecting a large geographic area and generally associated with erosion potential within agricultural lands.

- Fall harvest activities produce fugitive dust emissions along unpaved haul roads are enhanced, especially under dry conditions typically occurring during the autumn.

- Building and terrain-influenced downwash results in elevated emission plumes during windy conditions.

- Wind blows from the nearby industrial complex toward the ambient monitoring site. This suggests that emission sources within this industrial area may have been responsible. High 24-hour PM_{10} concentrations were less frequently observed after one facility switched to a wet ore handling system and another facility closed.

- Wintertime stagnation episodes, especially in the Pocatello urban area, usually occur in December and January and are associated with a deep stable layer, a strong subsidence inversion during the day, cold temperatures, light winds, high relative humidity, fog, and snow cover. Dispersion is inhibited under these conditions such that plume rise from industrial sources is reduced, the strong inversion traps pollutants near the surface, and the light winds provide little ventilation. In addition, these conditions tend to allow for an increase in the formation of secondary aerosols, including ammonium sulfate, ammonium nitrate and mono-ammonium phosphate, and nitrate particles. The effect of the inversions can be made worse in the presence of snow covering the ground because snow cover reflects incoming solar radiation and inhibits the warming of the lowest layers of the atmosphere. Snow cover is also a source of moisture that can help produce fog, which, in turn, enhances wet chemical mechanisms believed to promote sulfate and phosphate particle formation. The snow and fog also reduce solar heating at low levels which, inhibits the breakup of the inversion.

Wintertime stagnation episodes are the most likely to result in prolonged periods of high 24-hour PM_{10} concentrations in the PVNA. From a climatological perspective, a stagnation episode is characterized by an inversion that sets up in the Portneuf Valley after a low pressure system passes through the area. The valley becomes filled with cold air, and the surface high pressure that quickly follows traps the cold air in the valley, overriding it with warmer air. With this inversion of temperature (i.e., cold air at the surface and warm air aloft), pollutants generated by ground-level sources within the cold air cannot rise into the warmer air above the inversion boundary. Because the synoptic wind field tends to be weak (which is typical of an area under a high pressure system), the local wind field becomes controlled by the channeling effect of the Snake River and Portneuf Valleys and the blocking effect of the Bannock and Pocatello mountain ranges. The local conditions can then dominate dispersion in the lower levels of the atmosphere. During an inversion, local conditions include light and variable winds, which both tend to increase stagnation and decrease dispersion. This trapping effect within the inversion contributes to elevated PM_{10} levels in the urban portion of the PVNA, but the amount of pollutant that can build up over time is dependent on the strength and duration of the inversion.

The meteorological factors that determine the amount of dispersion include wind speed, atmospheric stability, precipitation, and the amount of solar warming. The IDEQ has identified the following meteorological profile that is likely to result in elevated PM_{10} concentrations in the PVNA (10-029). This includes:

- Maximum daily surface temperature of 32 °F or less,
- Mean daily wind speed of 5.5 miles per hour or less,
- Snow-cover, and
- Daily precipitation of 0.06 inch or less.

All these conditions need to exist at the same time. These are conditions that typically occur during a winter stagnation episode in the PVNA; that is, a cold high-pressure system, low horizontal pressure gradient resulting in low winds, and shallow inversions that inhibit dispersion and allow buildup of air pollutants. Also, with a high-pressure system, appreciable precipitation needed to scour pollutants out of the atmosphere is not likely to occur.

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CONTENTS

FIGURES

TABLES

11. HYDROLOGY / FLOODING

In this section, three topics regarding flooding/hydrology are analyzed for the Atomic City site. The first topic focuses on evaluating existing available information regarding any Maximum Probable Flood (MPF) studies that have been performed in the vicinity of the proposed site. The second topic identifies site characteristics that could be used in future calculations to determine the peak runoff flow rates associated with on-site and off-site drainage subbasins. The third section identifies current or planned activities that could reasonably be expected to affect the MPF. A general project area description pertaining to hydrology/flooding is included in the site visit report (11-007). Map base information is derived from maps in Section 1, *Maps*. Any overlay data are indicated in figure captions.

11.1 Overview and Summary

The report requirements consist of description of the MPF, the flood sources, and any current or planned activities that could reasonably be expected to affect the MPF. Per the site visit report (11-007) and the USGS topographic quadrangle map for Atomic City (Figure 11-1) (11-003), it was determined that there are no permanent surface-water features on the Atomic City site. Based on a search of available sources and agencies (INL, Federal Emergency Management Agency [FEMA], USGS, and IDWR), no site-specific MPF studies were located for the proposed site. The nearest surface-water feature is the Big Lost River, which is an intermittent flowing river located 9.5 miles from the proposed site (Figure 11-2) (11-003, 11-004). Runoff from the proposed site flows to the north onto the INL property, where it combines with other intermittent flows until it reaches a regional depressional area, known as Cottontail Waterhole. At this depressional area, accumulated runoff will either infiltrate into the ground or will be evaporated into the atmosphere and will never reach the Big Lost River. Therefore, the proposed site is not located within the Big Lost River drainage basin. Infiltrated runoff will instead migrate downward until it reaches the Snake River Plain aquifer.

The Atomic City site is located within the ESRP, which is bounded on the north and south by mountains and valleys associated with the Basin-and-Range Province. The INL covers approximately 890 square miles within the ESRP, and much of the remaining rangeland within the ESRP is controlled by the BLM. These surrounding mountains trend perpendicular to the axis of the Snake River Plain. USGS topographic maps (7.5 minute series) for Atomic City (11-003) and Circular Butte 3 South East (11-004) illustrate the topographic features and contributing surface-water drainage areas pertinent to the site.

The Atomic City site is at a location that is remote from streams and rivers that could be sources of flooding, and the site is far from any identified flood plains. This information represents the best available data to support analysis of potential environmental impacts of constructing and operating the proposed GNEP facilities.

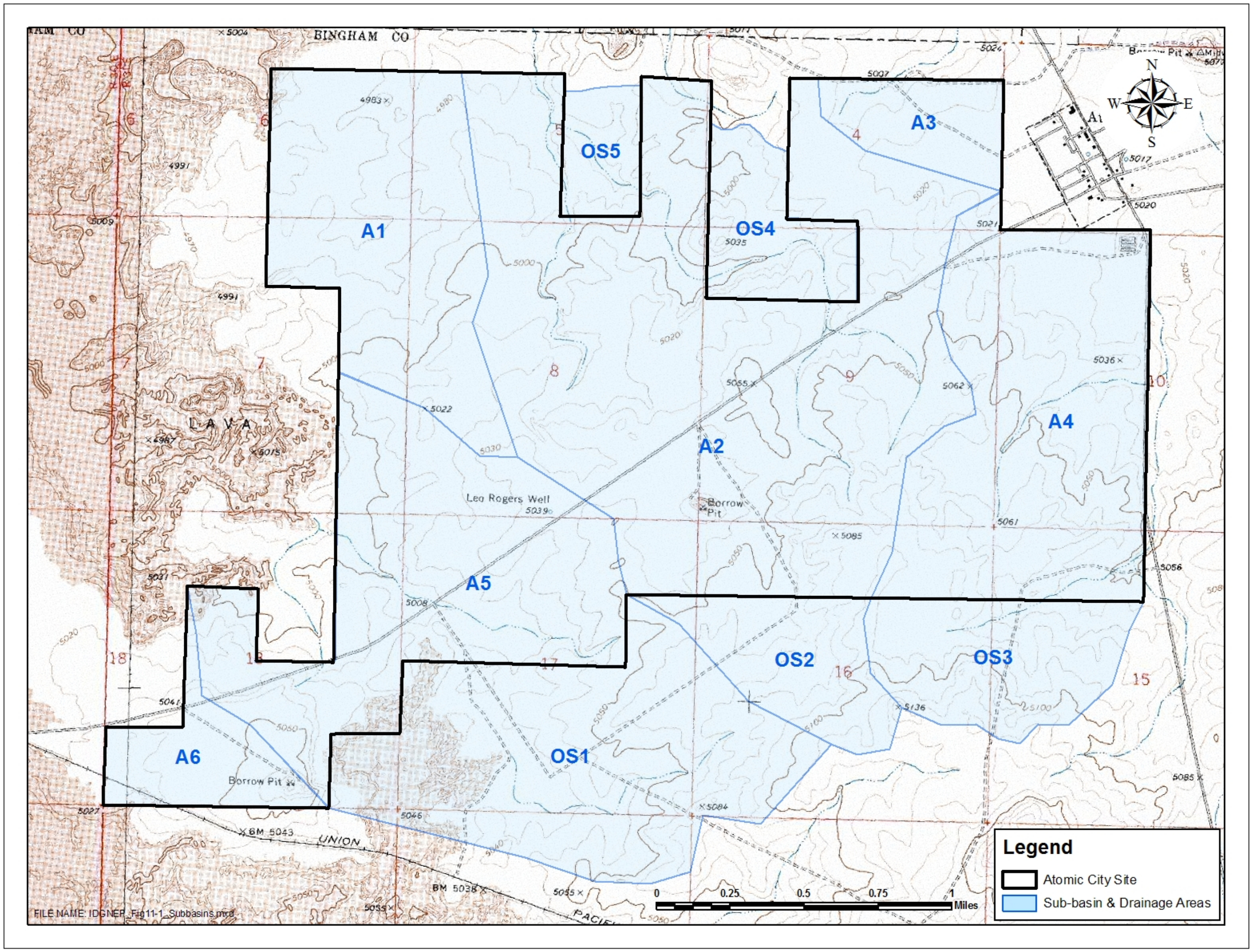

Figure 11-1. Subbasins (identified by the alphanumeric designator and delineated by blue lines), Atomic City site (11-003, 11-007). "OS" refers to off-site subbasin area. All other subbasins are located on-site.

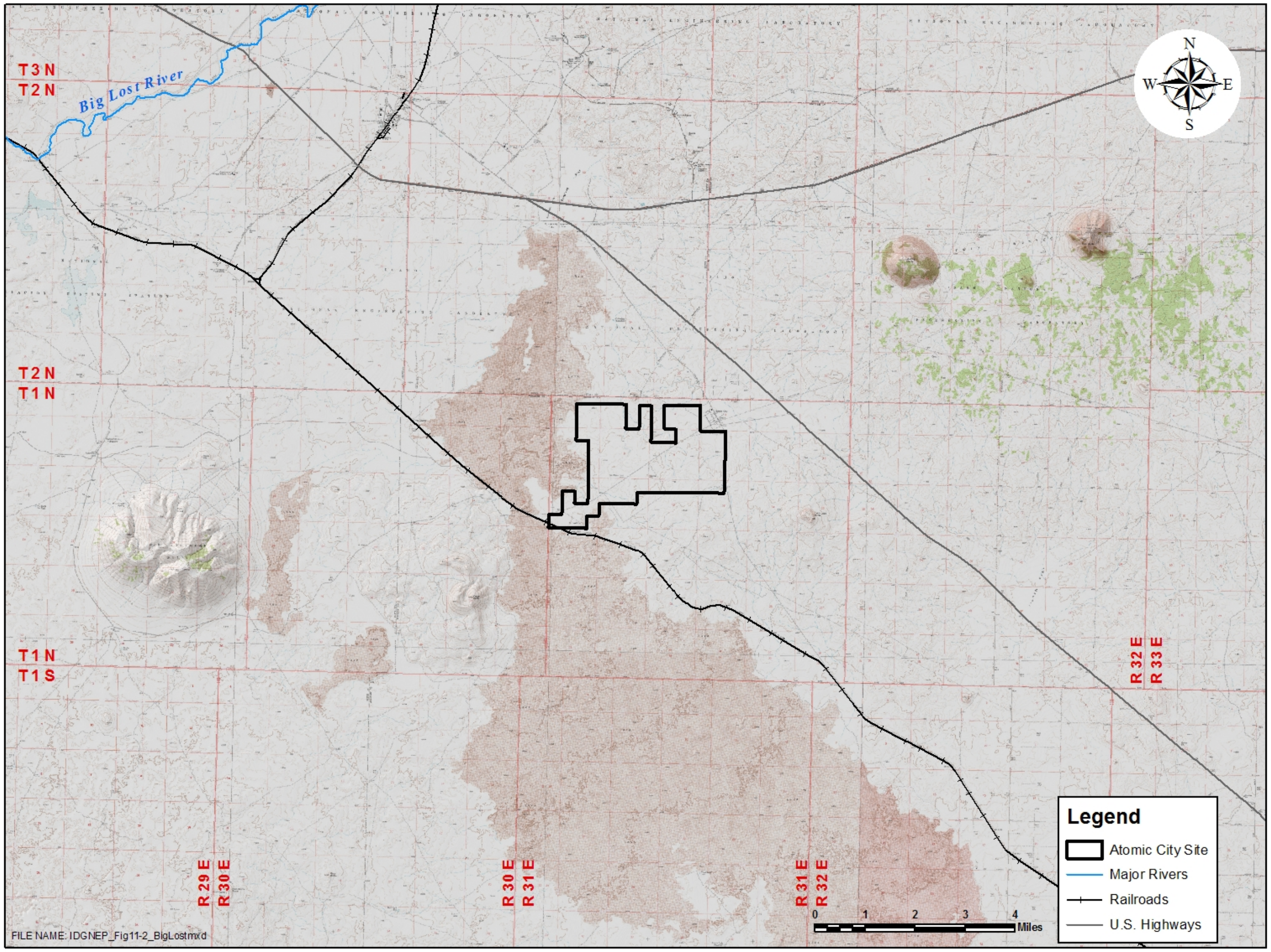

Figure 11-2. Location of the Big Lost River with respect to the proposed Atomic City site.

Review of the hydrology and flood sources that could reasonably be expected to affect the MPF for the Atomic City site are summarized as follows:

- The nearest surface water feature is the Big Lost River, an intermittent flowing river located 9.5 miles from the Atomic City site;
- The Atomic City site is not within any of the 10-, 50-, 100- or 500-year flood plains delineated in government studies;
- The Atomic City site is over nine miles from the nearest 100-year or 500-year flood plains identified in previous studies and references;
- Failure of the Mackay Dam does not represent a flood hazard to the Atomic City site, and any flood inundation areas would still be 8.5 miles distant;
- Run-on to the site from perennial streams does not occur;
- Field studies were conducted as part of this review to delineate the overall watershed area and subareas, drainage reaches, and stream channel dimensions (if applicable) and to describe vegetative cover and condition; and
- No evidence exists of the potential for severe environmental consequences associated with the hydrology/flooding for the construction and operation of the GNEP facilities.

11.2 Maximum Probable Flood

The AMS defines “maximum probable flood,” also called the “probable maximum flood,” as “the flood that can be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in a region” (11-010). No return frequency or recurrence interval is specified, nor are the parameters describing the flood event (e.g. elevations or flows). Results of MPF evaluations are typically used by the DOE for site selection and facility design. Sites above the Design Basis Flood level are preferred, thereby avoiding the flood hazard and eliminating consideration of flood loads as part of the design. The design of the site stormwater management system and structural systems (e.g., roofs) for local precipitation must be adequate to prevent flooding and structural loadings that may damage the facility or interrupt operations to the extent that performance is impaired (11-011).

11.2.1 Existing Site Specific Flood Studies

Streamflow from the Big Lost River originates in the mountains of the Salmon-Challis National Forest and flows to the southeast until it is restricted at the Mackay Reservoir, located four miles northwest of Mackay and approximately 52 miles northwest of the Atomic City site. The river continues to the southeast and east until it reaches the INL diversion dam (Figure 11-3). This structure diverts excess flood flows to a series of overflow spreading areas constructed in the 1950s to assist in the protection of INL facilities from flooding. Flows not diverted to the spreading areas continue in the channel of the Big Lost River to the northeast through the INL and eventually infiltrate in the area identified as the Big Lost River Sinks and four associated playas near TAN (see Figure 11-3).

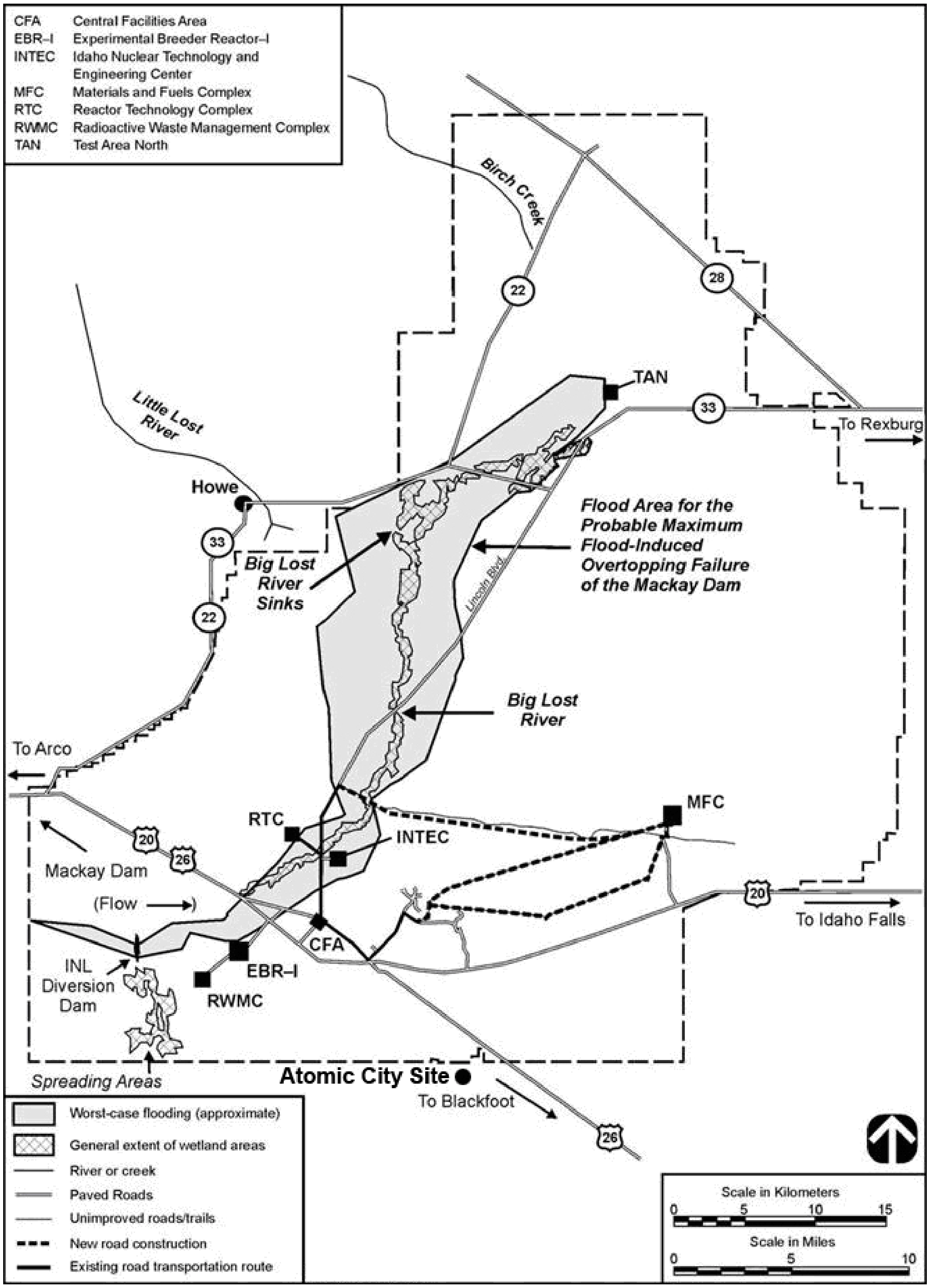

Figure 11-3. Area of the Maximum Probable Flood on the Big Lost River (11-008).

Numerous studies have been prepared for the Big Lost River because of its location with respect to the INL. Many of the studies focus primarily on the 100-year and 500-year flood plains and flood plain inundation extents. One study that specifically analyzed the MPF of the Big Lost River, however, is the "Flood Routing Analysis for Failure of Mackay Dam" (11-001). This study analyzed the effects of a failure of the Mackay Dam due to the MPF above the dam. The resulting river flows included not only the MPF, but also flows introduced to the Big Lost River due to the overtopping and subsequent breaching failure of the dam.

11.2.1.1 Big Lost River Maximum Probable Flood Study

In the Koslow and Van Haaften report (11-001), four different scenarios were analyzed in an attempt to predict the effects of a Mackay Dam failure: seismic failure of the dam coincident with the 25-year recurrence interval flood, hydraulic failure of the dam with the 100-year recurrence interval flood, hydraulic failure of the dam with the 500-year recurrence interval flood, and overtopping failure caused by the MPF. The hypothetical MPF of the drainage basin above the Mackay Dam was determined by Koslow and Van Haaften to be from the "48-hour general storm in June, preceded three days in time by an antecedent storm with a magnitude of 40 percent of the 48-hour storm." Overtopping failure and subsequent failure of the dam due to the MPF were determined to result in the maximum flood inundation areas (see Figure 11-3 and 11-008).

Mackay Dam has a storage capacity of 44,500 acre-feet at a water surface elevation of 6,066.5 feet. The total discharge capacity of the spillway is less than 10,000 cubic feet per second. Koslow and Van Haaften referenced the peak flow into the reservoir from the MPF to be approximately 82,100 cubic feet per second. The result of the MPF inflow into the reservoir would be an overtopping of the dam, which would lead to subsequent breaching of the dam. The resulting flow rates from the MPF-induced breaching of the dam was 306,700 cubic feet per second directly downstream of the dam and 71,850 cubic feet per second at the INL diversion dam (11-001).

The nearest reach of the Big Lost River is 9.5 miles to the northwest of the Atomic City site. Mapped flood areas (Figure 11-3) indicated that the flooding associated with the overtopping failure of the Mackay Dam would still be at least 8.5 miles from the site. Four INL facilities, the RWMC, the CFA, the EBR-1, and the INTEC are located between this reach and the Atomic City site. Of the four facilities, only one facility, INTEC, is subject to flooding resulting from the dam failure. CFA, which is situated between the Big Lost River and the proposed site at elevations ranging between 4,928 and 4,940 feet, would not be subjected to flooding.

With the exception of localized depressional areas, the ground at the Atomic City site generally slopes from south to north. The average elevation of the Atomic City site is above 5,000 feet; therefore, it is situated above the MPF-induced dam failure flood elevation.

11.2.1.2 Flood Plain Delineated by Federal Emergency Management Agency

The FEMA Flood Insurance Rate Map (FIRM) Index (11-012) identifies the Atomic City site as lying within Community Panel 1600180100 B (11-002) (Figure 11-4). The designation "B" describes "… flood insurance rate zones that correspond to areas outside the one-percent annual chance flood plain, areas of one-percent annual chance of sheet flow flooding where average depths are less than 1 foot, areas of one-percent annual chance stream flooding where the contributing drainage area is less than one square mile, or areas protected from the one-percent annual chance flood by levees. No Base Flood Elevations or depths are shown within this zone. Insurance purchase is not required in these zones."

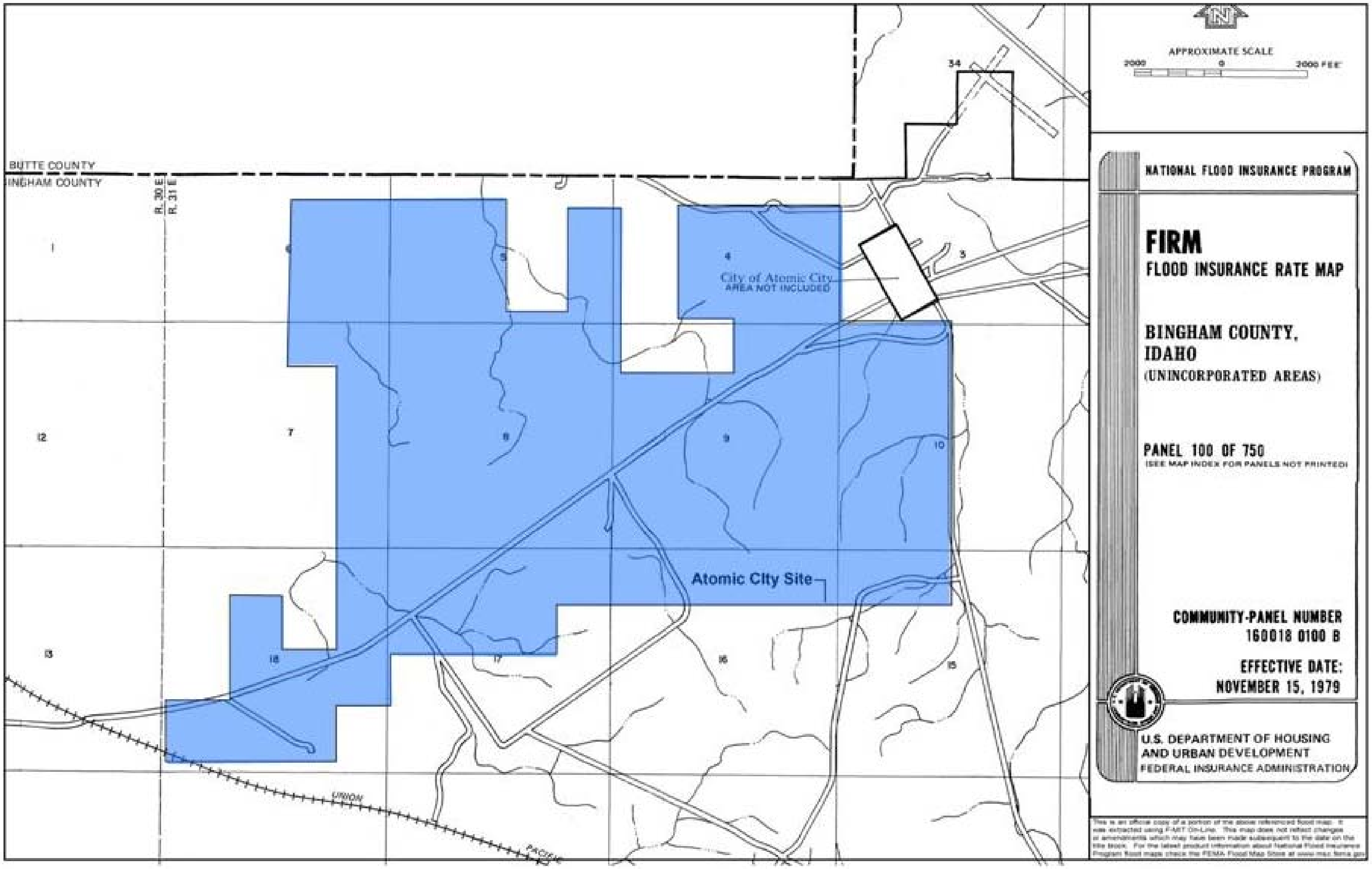

Figure 11-4. Flood Insurance Rate Map for Bingham County, Idaho, showing the “B” designation for the area (outside of a defined 100-year flood plain). Modified to show the Atomic City site boundary (11-002).

Based on the Butte County FEMA FIRM Index (11-013), most of the Unincorporated Butte County panel, located north of the Atomic City site, has not been printed, presumably because most of the covered land is federally owned. Unprinted community panels for these areas, however, are identified with an "A" flood-zone designation, which describes "Areas of 100-year flood; base flood elevations and flood hazard factors not determined." This designation is due to the area's proximity to the Big Lost River. Community Panel, Butte County, Idaho (unincorporated areas) 1600330975 A (Figure 11-5), which was printed, indicates a relatively wide flood-zone-A designation associated with the Big Lost River adjacent to Arco. Per this FIRM, the flood plain then narrows as the river flows to the east toward the INL.

11.2.1.3 Additional Flood Plain Studies

Recent flood plain studies have also been performed by the USGS (in 1998) and the U.S. BOR in (1999) (11-008). Figure 11-6 shows the 100-year and 500-year flood plains as depicted in the U.S. Bureau of Reclamation study. Based on this study, the INL CFA is not subjected to flooding during the 100-year or 500-year flood event. It can be inferred; therefore, that the Atomic City site will not be subjected to flooding for the above referenced storm events on the basis of distance and elevation.

11.2.1.4 Summary

No existing studies were identified that specifically analyzed the MPF for the Atomic City site. Based on the Koslow and Van Haaften report, however, the proposed site lies approximately 8.5 miles from any flood inundation areas induced by the MPF above the Mackay Dam and subsequent failure of the Mackay Dam. The Atomic City site is 9.5 miles from the nearest 100-year flood plain identified in the FEMA FIRM or other DOE-commissioned studies, and remote from any perennial surface-water feature. It is, therefore, determined that the proposed site is not subject to flooding due to the MPF of the Big Lost River.

11.3 Determination of Localized Runoff Conditions

Future project stages may require an analysis of peak runoff flow conditions onto and off of the Atomic City site. This section provides the information necessary to determine peak runoff flow rates both from the Atomic City site and from off-site subbasins tributary to the Atomic City site. Methods of determining localized peak runoff flow rates, data requirements, existing available data, and site visit findings are summarized below.

11.3.1 Technical Release-55 Method

Many methods can be used to determine peak runoff flow rates, but Technical Release-55 (11-009) was chosen for this report due to its availability and applicability to a wide range of site conditions. Its applicability and data input requirements and parameters are discussed below.

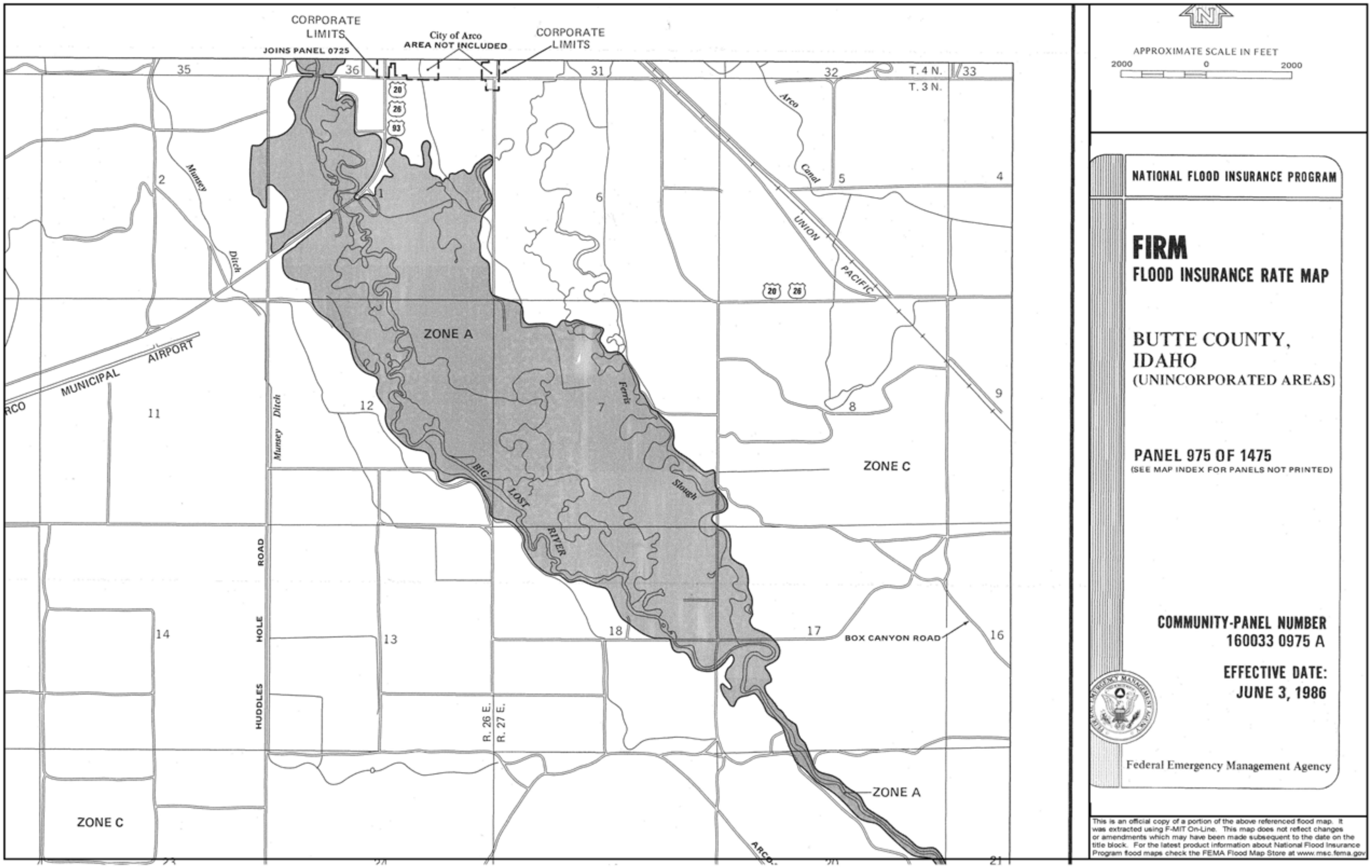

Figure 11-5. Flood Insurance Rate Map for Butte County near Arco, Idaho, showing the flood plain and the “A” designation (areas of 100-year flood) (11-017).

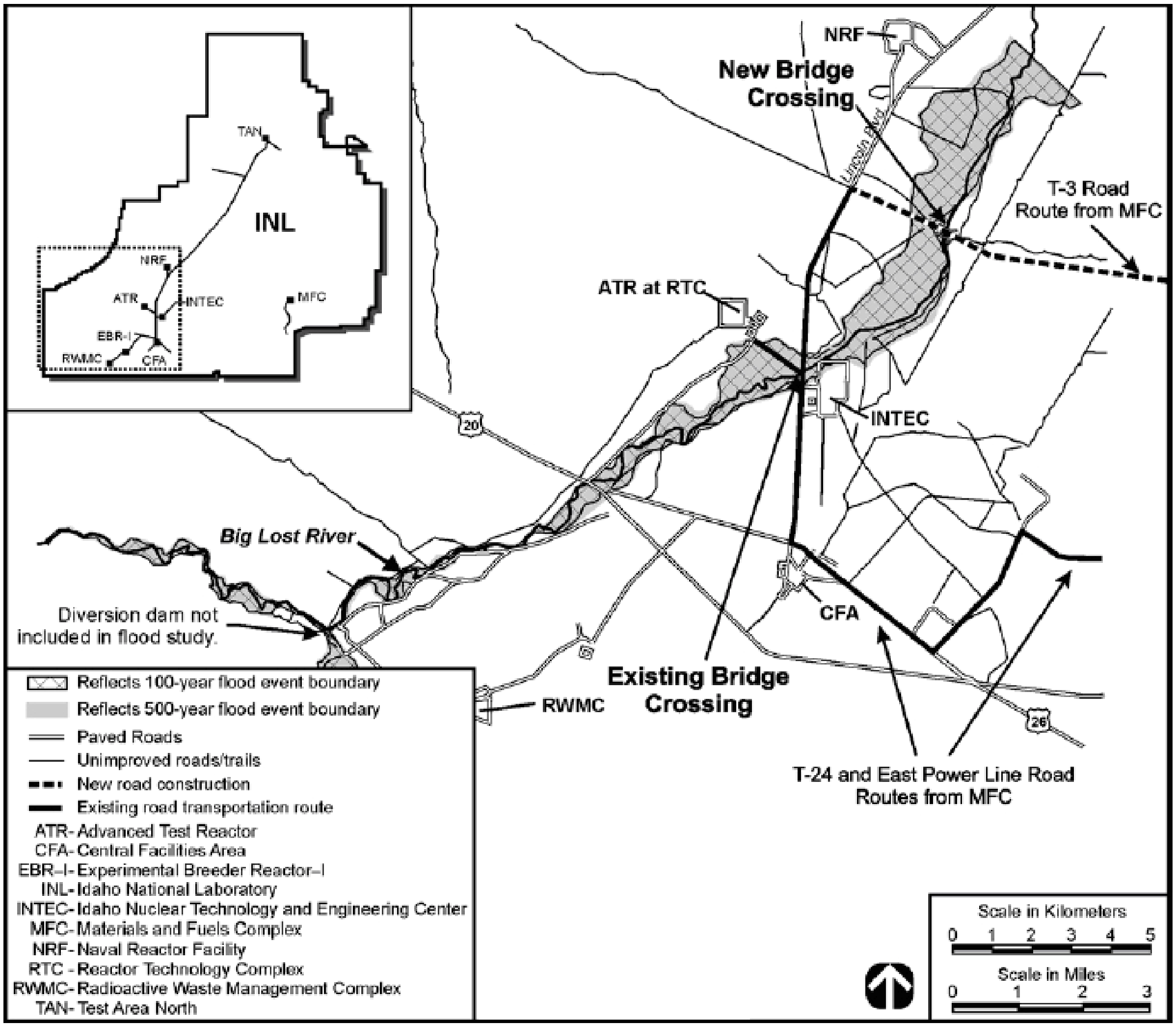

Figure 11-6. The 100-year and 500-year flood event boundaries, Big Lost River (11-008).

11.3.1.1 Applicability

Technical Release-55 was designed primarily to evaluate the effects of urbanization on small watersheds. The NRCS defines small watersheds as "…the land surface draining to a definable point on a stream channel, where the area is less than 10 square miles" (11-009). This is appropriate for the scale of the Atomic City site.

General limitations of the use of Technical Release-55 (11-009), Chapter 1, page 1-4, are listed below:

- The methods used are based on open channel and/or unconfined overland flow; more information is required to account for flow in sewers.

- Either a Graphical Peak Discharge and a Tabular Hydrograph method can be used; however, the graphical method is only appropriate for a single watershed subarea. Watersheds with multiple subareas can be modeled using the Tabular Hydrograph method.

- Maximum area suitable for analysis is 25 square miles. No minimum is specified; however, the guidance for its use states, “The user should carefully examine results from sub-areas less than 1 acre.”

- The model is limited to 1 to 10 watershed areas.

11.3.1.2 Data Requirements

To obtain peak flow rates and runoff depths, Technical Release-55 requires certain site-specific information. Required information includes subbasin area (based on watershed delineations), runoff curve number (RCN) information, rainfall data, and subbasin time of concentration. Data are gathered from both site visit field reports and other available sources. These data requirements and site specific gathered information are identified below.

Subbasin Area (Watershed Delineations)

A combination of the USGS Atomic City Quadrangle Map (11-003) and the field survey report (11-007) were used in the determination of on-site and off-site subbasin areas. The resulting five on-site and five off-site subbasins are shown in Figure 11-7. Table 11-1 lists subbasin areas along with other applicable information.

Determination of Runoff Curve Number

The major factors used to determine of the RCN are the vegetative cover type (including vegetative density), hydrologic soil group, and the Antecedent Runoff Condition (ARC). The ARC is the runoff potential of the site prior to a storm event. For the purposes of a general discussion of peak runoff conditions, it is assumed that the average values as listed in Technical Release-55 (11-009) would be applicable. The field survey was used to determine the subbasin vegetative ground cover, and a combination of the NRCS Soils Survey (11-005) and the field survey were used to determine applicable soil types. Vegetative covers are listed in the site visit report (11-007), and soil types based on information derived from Figure 11-7 are listed in Table 11-1.

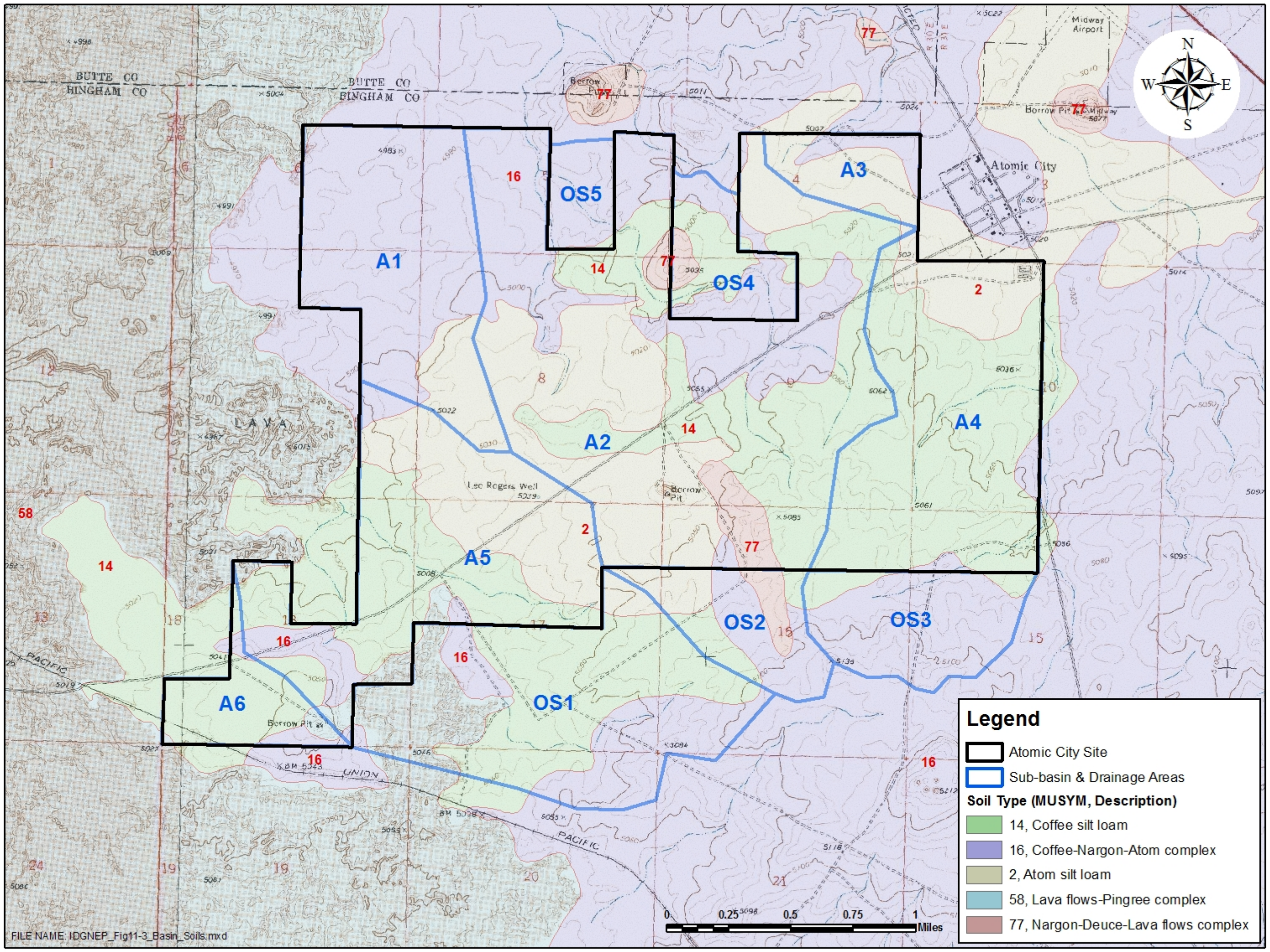

Figure 11-7. On-site and off-site subbasins and soil types, Atomic City site (11-005, 11-007).

Rainfall Data

- Rainfall distribution is generated synthetically by the Technical Release-55 program, depending on geographic region. All of Idaho, including the Atomic City site, lies within a Type II distribution (11-009).

- Rainfall for the selected return frequency is obtained from the NOAA NWS, Office of Hyrdology, Atlas 2, Volume 5, Isopluvial Maps (11-006). For instance, the 24-hour 100-year precipitation interpolated between the two isopluvial lines bracketing the Atomic City site (Figure 11-8) is 2.55 inches.

Table 11-1. Correlation of Atomic City site soil units to Technical Release-55 hydrologic soil group (11-007, 11-009, 11-003).

Subbasin Name	Area (acres)	Present Soil Groups	Hydrologic Classification
A1	466.7	2-Atom Silt Loam	B
		16-Coffee-Nargon-Atom complex	B/C
A2	1,291.5	16-Coffee-Nargon-Atom complex	B/C
		2-Atom Silt Loam	B
		14-Coffee Silt Loam	B
		77-Nargon-Deuce-Lava flows complex	C/D
A3	111.3	2-Atom Silt Loam	B
		16-Coffee-Nargon-Atom complex	B/C
		14-Coffee Silt Loam	B
A4	604.8	2-Atom Silt Loam	B
		14-Coffee Silt Loam	B
		16-Coffee-Nargon-Atom complex	B/C
A5	610.8	2-Atom Silt Loam	B
		14-Coffee Silt Loam	B
		16-Coffee-Nargon-Atom complex	B/C
		58-Lava flow-Pingree Complex	D
A6	126.4	14-Coffee Silt Loam	B
		16-Coffee-Nargon-Atom complex	B/C
		58-Lava flow-Pingree Complex	D

Table 11-1. (continued).

Subbasin Name	Area (acres)	Present Soil Groups	Hydrologic Classification
OS1	593.8	2-Atom Silt Loam	B
		14-Coffee Silt Loam	B
		16-Coffee-Nargon-Atom complex	B/C
		58-Lava flow-Pingree Complex	D
OS2	170.3	2-Atom Silt Loam	B
		14-Coffee Silt Loam	B
		16-Coffee-Nargon-Atom complex	B/C
		77-Nargon-Deuce-Lava flows complex	C/D
OS3	220.9	14-Coffee Silt Loam	B
		16-Coffee-Nargon-Atom complex	B/C
OS4	137.0	2-Atom Silt Loam	B
		14-Coffee Silt Loam	B
		16-Coffee-Nargon-Atom complex	B/C
		77-Nargon-Deuce-Lava flows complex	C/D
OS5	73.9	14-Coffee Silt Loam	B
		16-Coffee-Nargon-Atom complex	B/C

Travel Time/Time of Concentration for Each Subbasin

Time of concentration is the time required for water to flow from the farthest point in the watershed to the outlet. Data required to calculate time of concentration include:

- Vegetative cover and ground surface description. These data can be obtained from the field survey report (11-007).

- Slopes of subbasins and reaches and slope lengths. Slopes of subareas are generally 1 to 3 percent. Over the entire Atomic City project location, only one runoff conveyance element could be considered a drainage channel. This poorly defined channel, which was observed at the northern property boundary, was a confluence of two drainage subareas located within subbasin A2. Most of runoff throughout the site most likely would infiltrate into the relatively well drained soils would evaporate into the atmosphere prior to becoming channelized. The observed drainage channel is shown in field survey photos 7, 8, and 9 (11-007). The vegetative cover changes from sagebrush to grass, but there are no definite signs of channel scour and erosion. The channel bottom is mainly a gravelly soil with little vegetative cover.

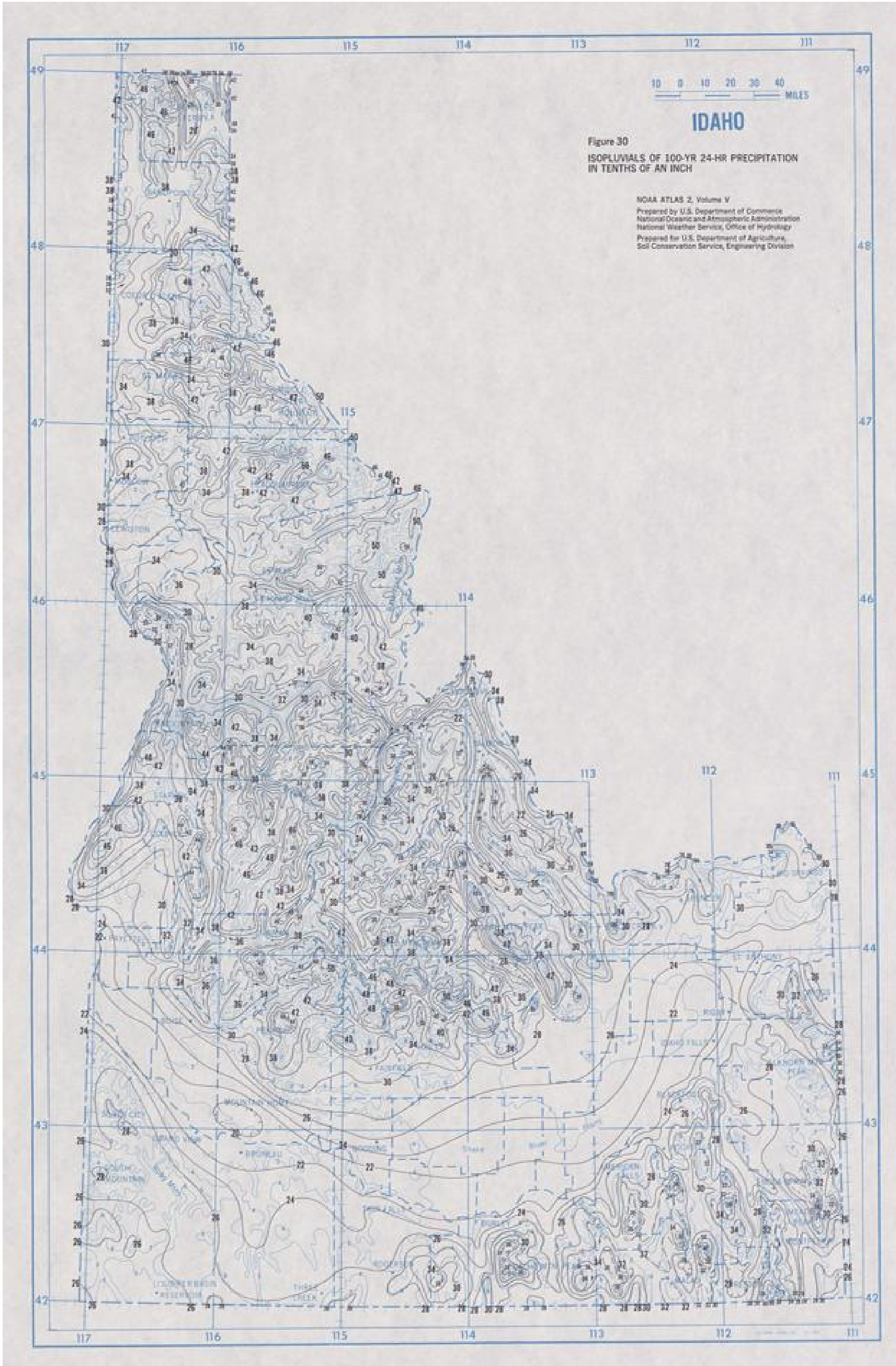

Figure 11-8. The 100-year, 24-hour precipitation map for Idaho (11-006).

- Manning's roughness coefficient (*n*). Methods for calculating and/or lookup values for Manning's *n* are provided by the USACE and USGS (11-015, 11-016). Surface coverage is shown and described for specific areas and drainage channels in the field survey report (11-007).

11.4 Sources for the Maximum Probable Flood

The Atomic City site is remote from rivers and other major bodies of water that could be sources of flooding, and the site is far from identified flood plains (Section 11.2). The river closest to the Atomic City site, the Big Lost River, is 9.5 miles away. Although flooding has occurred along the Big Lost River and FEMA has identified floodplains along the river and its tributaries, the Atomic City site is remote from areas affected by flooding along rivers and streams and is higher in altitude. The only likely flood source is runoff from precipitation on watersheds at the Atomic City site as discussed in Section 11.3.

11.5 Effect of Current or Planned Activities on Maximum Probable Flood

The DOE and INL are continually constructing new projects or revising existing projects. Some of the projects may be in close proximity to the Big Lost River. Any work within the Big Lost River flood plain, however, would need to fulfill the "Flood Plain Management" Executive Order 11988, which "encourages measures to preserve and enhance the natural and beneficial functions of flood plains." This order also has requirements "to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of flood plains and to avoid direct and indirect support of flood plain development wherever there is a practicable alternative" (11-008). Also, due to INL flooding issues in the past, it is unforeseeable that any construction would be allowed on the INL that would significantly raise the MPF elevations of the Big Lost River.

No preliminary layout plans for the Atomic City site were available at the time this report was prepared. On-site peak flow rates would obviously be expected to increase with any new construction on the Atomic City site, due to an increase in impervious area. It is assumed, however, that the site could maintain existing preconstruction runoff rates through the use of an on-site detention pond or similar restricting feature. Similarly, any construction that took place on previously defined off-site drainage subbasins would also be required to maintain preconstruction runoff rates; therefore, additional off-site runoff onto the site is not expected.

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CONTENTS

TABLES

12. REGULATORY AND PERMITTING

This section identifies major requirements that could be applicable to the construction or operation of GNEP facilities at the Atomic City site. The section discusses federal, state, and local provisions; identifies specific permitting requirements; and describes potentially applicable requirements that may not include project-specific permits or approvals.

12.1 Overview and Summary

National, state, and regional regulatory and environmental requirements were reviewed and analyzed to identify permits, approvals, and procedures that could impose requirements on GNEP facilities developed and operated at the Atomic City site, and to pinpoint any requirements that might impose barriers to siting such facilities.

- No legislative or regulatory prohibitions that might prevent siting GNEP facilities at Atomic City were identified, and no processes that contained requirements capable of barring such facilities were found.
- The body of data developed in the overall site study uniformly indicate that needed permits and approvals will be obtainable.
- Site data indicate that federal requirements for historic, tribal, and cultural resource protection can be met.
- Because of factors unique to the site, for example that it sits over 30 miles from the nearest waters of the United States, some permits, such as an §404 permit, are not likely to be required.

Table 12-1 provides a detailed cross-walk between the body of applicable federal (Sections 12.2 and 12.3), state (Section 12.4), and local (Section 12.5) regulations or permitting requirements. A conservative approach was taken to review the regulatory and permitting requirements. Because the facility design has not been finalized, the specific applicability of certain requirements could not be determined. In such cases, the various permitting scenarios are identified, as well as the conditions under which each type of permit would apply.

Table 12-1. Summary of regulatory and permitting requirements for Atomic City site.

Activity/Program	Action or Requirement	Statute or Regulation	Agency(ies)
Section 12.2	**Atomic Energy Act Requirements**		
Advanced Burner Reactor Licensing (Section 12.2.1)	Domestic licensing of production and utilization facilities	10 CFR 50	NRC
	Early Site Permit (ESP)	10 CFR 52	NRC
	Standardized Design Certifications	10 CFR 52	NRC
	Combined licenses for nuclear power plants	10 CFR 50 10 CFR 52	NRC
Consolidated Fuel Treatment Center: Processing Facility (Section 12.2.4.1)	Domestic licensing of production and utilization facilities	10 CFR 50	NRC
Consolidated Fuel Treatment Center: Fuel Fabrication Facility (Section 12.2.4.2)	Domestic licensing of special nuclear material	10 CFR 70	NRC
Section 12.3	**Other Federal Programs and Requirements**		
Air Emissions (Section 12.3.1)	Compliance with National Primary and Secondary Ambient Air Quality Standards	40 CFR 40	EPA
	New Source Performance Standards (NSPS)	40 CFR 60	EPA
	National Emission Standards for Hazardous Air Pollutants (NESHAPs)	40 CFR 61	EPA
	New Source Review (NSR)	40 CFR 51	EPA (actual permits issued by IDEQ)
	Radioactive emissions	10 CFR 20	NRC

Table 12-1. (continued).

Activity/Program	Action or Requirement	Statute or Regulation	Agency(ies)
Wastewater and Storm Water Discharges (Section 12.3.2)	National Pollutant Discharge Elimination system (NPDES) Permit	40 CFR 122 40 CFR 123 40 CFR 124	EPA
	NPDES Stormwater Permit: Stormwater Pollution Prevention Plan, Construction General Permit	40 CFR 122 40 CFR 123	EPA
	Section 404 (Wetlands) Permit	33 CFR 320 - 330	USACE
Natural Resources (Section 12.3.3)	Endangered Species Act (ESA) Section 7 consultation	50 CFR 402.6	Fish and Wildlife Service
Historical, Tribal, and Cultural Resources (Section 12.3.4)	Notification for discovery of unanticipated archaeological materials (Archaeological and Historic Preservation Act [AHPA])	16 U.S.C. 469 – 469c	Department of the Interior
	Permit for excavation or removal of archaeological resources (Archaeological Resources Protection Act [ARPA])	16 U.S.C. 470aa et seq.	Department of the Interior; affected Native American Tribes
	Permit to Proceed (Antiquities Act)	16 U.S.C. 431 36 CFR 296 43 CFR 3 and 7	Department of the Interior
	American Indian Religious Freedom Act	42 U.S.C. 1996	Various Federal agencies
	Native American Graves Protection and Repatriation Act	25 U.S.C. 3001	Department of the Interior
	Consultation and coordination with Indian tribal governments	EO 13175	Department of the Interior
National Environmental Policy Act (NEPA) (Section 12.3.5)	Environmental Impact Statement	42 USC 4321 et seq.	DOE, NRC, EPA
	Environmental protection regulations for NEPA implementation - licensing and related regulatory functions	10 CFR 1021 10 CFR 51	DOE, NRC

Table 12-1. (continued).

Activity/Program	Action or Requirement	Statute or Regulation	Agency(ies)
Federal Land Management (Section 12.3.6)	Federal Land Policy and Management Act (FLMA) of 1976	43 U.S.C. 1701 et seq.	BLM
Hazardous Materials Packaging and Transportation (Section 12.3.7)	Hazardous Materials Transportation Regulations	49 CFR 171-180 49 CFR 397	DOT
	Radioactive Materials Packaging and Transportation Regulations	10 CFR 71 10 CFR 73	NRC
Hazardous Material Inventory and Toxic Release Reporting (Section 12.3.8)	Emergency Planning and Community Right-to-Know Act (EPCRA), Sections 311 and 312	42 U.S.C. 11001 et seq.	State Emergency Response Commission (SERC), Local Emergency Planning Committee (LEPC), local fire department
	EPCRA, Section 313	42 U.S.C. 11001 et seq.	EPA, IDEQ
Section 12.4	**State Programs and Requirements (including state implementation of Federal requirements)**		
Idaho Construction Permits (Section 12.4.1)	Electrical Permit	IDAPA 07.01.02	Idaho Division of Building Safety (IDBS) Electrical Bureau
	Plumbing Permit	IS Title 54, Chapter 26 IDAPA 07.02.03	IDBS Plumbing Bureau
	Heating, Ventilation, and Air Conditioning (HVAC) Permit	IS Title 54, Chapter 50 IDAPA 07.07.01	IDBS HVAC Bureau
Idaho Air Quality Program (Section 12.4.2)	New Source Review (NSR) preconstruction permitting program	IDAPA 58.01.01.200 et seq.	IDEQ
	Air quality operating permit	IDAPA 58.01.01.300 et seq.	IDEQ
	Idaho Air Toxics	IDAPA 58.01.01 et seq.	IDEQ

Table 12-1. (continued).

Activity/Program	Action or Requirement	Statute or Regulation	Agency(ies)
Wastewater and Water Quality (Section 12.4.3)	Wastewater Reuse Permit (formerly called a wastewater land application permit)	IDAPA 58.01.16 IDAPA 58.01.17	IDEQ
	Section 401 Certification Process	40 CFR 121	IDEQ
Drinking Water, Well Drilling, and Underground Injection (Section 12.4.4)	Drinking Water System Approval	40 CFR 141 40 CFR 142 40 CFR 143 IS Title 39, Chapter 1 IDAPA 58.01.08	IDWR
	Well drilling permit	IS Title 39, Chapter 1 IDAPA 58.01.08	IDWR
	Underground injection well permit	40 CFR Subpart D IS Title 42, Chapter 39 IDAPA 37.03.03	IDWR
Hazardous and Solid Waste Management (Section 12.4.5)	Treatment, Storage, and Disposal Facility (TSDF) Permit: Part A and Part B	40 CFR 124 40 CFR 264 40 CFR 270 IS Title 39, Chapter 44 IDAPA 58.01.05	IDEQ
	Hazardous waste facility siting criteria	40 CFR 264.18 40 CFR 270.14(b)(11)	IDEQ
	Idaho hazardous waste facility siting criteria: TSDF siting license	IS Title 58, Chapter 39	IDEQ
	Solid Waste Siting: location restrictions	IDAPA 58.01.06	IDEQ and SDHD
	Solid Waste Operating Plan	IDAPA 58.01.06	IDEQ and SDHD
	Solid Waste Design Application	IDAPA 58.01.06	IDEQ and SDHD
	Solid Waste Closure Plan	IDAPA 58.01.06	IDEQ and SDHD

Table 12-1. (continued).

Activity/Program	Action or Requirement	Statute or Regulation	Agency(ies)
Historical, Tribal and Cultural Resources (Section 12.4.6)	National Historic Preservation Act (NHPA) Section 106 Consultation	36 CFR 800	Advisory Council on Historic Preservation, SHPO
Radioactive Waste Shipments in Idaho (Section 12.4.8)	Shipment of transuranic waste to and from INL	1995 INL Settlement Agreement	State of Idaho, DOE, Department of Defense (Navy)
	Pacific States Agreement on Radioactive Materials Transportation Management	IS Title 39, Chapter 30	Idaho Legislature
State Involvement in Licensing Radioactive Materials	Idaho Radiation and Nuclear Material Act	IS Title 39, Chapter 30	IDEQ
Section 12.5	**Local (County and Regional) Programs and Requirements**		
Bingham County Construction Permitting and Approvals (Section 12.5)	Zoning change from agricultural (A) to heavy industrial/manufacturing use (M2)	Bingham County Planning and Zoning Ordinances	Bingham County
	Bingham County Building/Zoning/Mechanical Permit	IS Title 39, Chapter 41 Bingham County Planning and Zoning Ordinances	Bingham County
	Septic system site evaluations and permit	IDAPA 58.01.03 Bingham County Planning and Zoning Ordinances	Southeast District Health Department (SDHD)

12.2 Atomic Energy Act of 1954, as Amended

The Atomic Energy Act (AEA) of 1954 Public Law (PL) 83-703 as amended (12-001), governs civilian and military use of nuclear materials. The AEA requires licensing by the NRC for civilian use of nuclear materials. The AEA empowers the NRC to establish and enforce standards to protect health and safety at civilian nuclear facilities. Under the AEA, the DOE is responsible for regulating many of the facilities that it owns or operates. If the Atomic City site does not fall under the purview of the DOE, it would be regulated by the NRC as a commercial operation.

This section describes the licenses and certifications required for siting, design, construction, and operation of the GNEP Consolidated Fuel Treatment Center demonstration facility and/or the Advanced Burner Reactor.

12.2.1 Nuclear Power Plant Licensing Processes

The NRC provides two processes for licensing reactors. These processes are codified in:

- 10 CFR 50, Domestic Licensing of Production and Utilization Facilities (12-003); and
- 10 CFR 52, ESP; Standardized Design Certifications; and Combined Licenses for Nuclear Power Plants (12-005).

The NRC follows a standard review plan for conducting a comprehensive evaluation of a facility's safety analysis reports for every nuclear power plant (12-138). Criteria, including facility siting, design and operation, are addressed during licensing review. However, the 10 CFR 52 licensing process allows facility location and design to be approved as initial steps, followed by approval of construction and operation.

The 10 CFR 50 and 10 CFR 52 permitting processes are interrelated to some extent. 10 CFR 52 early site permit applications are reviewed in part against 10 CFR 50 standards. A 10 CFR 52 combined license application must include information equivalent to that required for a 10 CFR 50 operating license.

The NRC has recognized that its regulations for licensing reactors reflect experience gained with LWR. While many provisions are generic or independent of reactor technology, others are specific to LWR design. Design considerations for an advanced reactor will be different (12-006). It will be important for the NRC to be engaged early in the process so that an appropriate technical and regulatory infrastructure for licensing can be established.

12.2.2 10 CFR 50 (Two-Step) Process

The 10 CFR 50 process is based on licensing LWR facilities and may not be preferred for licensing an advanced reactor, though all currently operating plants were licensed under this process. Part 50 regulations require submission of both a Safety Analysis Report and an analysis of potential environmental impacts. When an application is deemed sufficient, the NRC publishes a notice in the federal register and holds an initial public meeting near the site.

The NRC conducts a safety review and an environmental review and determines whether the plant design meets applicable regulations. The Advisory Committee on Reactor Safeguards (ACRS) also reviews the application, submitting results to the NRC. Staff then prepares a Safety Evaluation Report and conducts a NEPA review. The NRC may grant an at-risk Limited Work Authorization. An Atomic Safety and Licensing Board public hearing is conducted before a construction permit can be issued.

The applicant then submits an application for an operating license, accompanied by a Final Safety Analysis Report. The NRC publishes notice of the application, prepares a Final Safety Evaluation Report, receives advice from the ACRS, and may then issue an operating license.

12.2.3 10 CFR 52 (Early Site Permit, Standard Design Certification and Combined License) Process

The 10 CFR 52 process contains three major elements: 1) ESP, 2) the standard design certification, and 3) the combined license (COL). An application may be sought for all three elements, or for a COL only without referencing an ESP or a standard design certification. In the latter case, NRC would review the technical and environmental information in the manner described for the two-step licensing process.

12.2.3.1 Early Site Permit

An ESP is the first step in the licensing process under 10 CFR 52. The purpose of the ESP is to assess the safety and environmental characteristics of the Atomic City site and evaluate whether an acceptable emergency plan can be developed. An applicant for an ESP must submit a site safety analysis, an environmental report, and emergency planning information. A generalized plant description with estimated maximum levels of radioactive and thermal effluents is also used to assess site suitability. The NRC documents its findings through a Safety Evaluation Report and in draft and final EISs.

An ESP is valid for no more that 20 years and can be renewed for 10 to 20 years. It allows limited site preparation work to be conducted prior to issuance of a construction license. The ESP typically undergoes a 21-month technical review period, followed by a 12-month period that ends in a Commission decision (12-135). Industry estimates are that the ESP approval process takes 2½ years (12-137). An ESP was issued to Exelon Generation Company for the Clinton Site near Clinton, Illinois on March 15, 2007. The permit process took 3½ years (12-134).

12.2.3.2 Design Certification

The NRC conducts an extensive review of a reactor plant design and provides approval of the design, independent of the particular location. Once a design is certified, a plant design can be ordered and licensed for the specific site. The certification process is formalized as a rulemaking with opportunities for public comment. The process includes review for safety concerns by the ACRS, an independent group that provides advice on reactor safety to the NRC. The process of design certification can last from 5 to 8 years (12-137). A design certification is effective for 15 years.

12.2.3.3 Combined License

The final step in licensing a nuclear reactor is a combined construction permit and operating license, referred to as a COL. The COL would reference the ESP and design certification, and issues resolved through the earlier proceedings are considered resolved for purposes of the COL application. The information required for an operating license application, pursuant to 10 CFR 50, must be provided. In addition, the inspections, tests, analyses, and acceptance criteria that will be used to assess the plant's compliance during construction and upon completion must be identified. The application is reviewed by the ACRS. The NRC will conduct a hearing before issuing a COL. The COL process could take up to 3 years (12-137). In addition to periodic inspections during construction, the NRC will assess the reactor's compliance with final acceptance criteria set out in the COL. The NRC must find that these criteria are satisfied before operation can commence.

12.2.4 Consolidated Fuel Treatment Center Licensing

The Consolidated Fuel Treatment Center would involve two activities licensed by the NRC: processing and fuel fabrication. 10 CFR 50 has also provided a licensing process for fuel treatment facilities. 10 CFR 70, Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility, provides a licensing process applicable to a fuel fabrication facility. The requirements for licensing are addressed in this section.

12.2.4.1 Processing Facility

A processing facility is defined as a production facility that requires a license under the regulations in 10 CFR 50, Domestic Licensing of Production and Utilization Facilities. The current requirements are based upon a LWR design for licensing a facility. Some of these requirements would not apply, and the design of the processing facility may introduce additional and different facility safety considerations. A case-by-case approach to licensing would be developed, or new rules would be established, to guide the licensing process. The NRC has indicated that the requirements of 10 CFR 51, Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions, and the agency's NEPA Procedures would also apply during licensing (12-007, 12-027). Environmental impacts related to transporting spent nuclear fuel to the processing facility and product shipments from the facility would have to be evaluated.

12.2.4.2 Fuel Fabrication Facility

A fuel fabrication facility would be licensed under 10 CFR 70, Domestic Licensing of Special Nuclear Material. The NRC has prepared regulatory guidance specific to a fuel fabrication facility, NUREG-1520, Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility (12-026). Additional guidance or requirements may be needed to address the specific feed stocks for the facility. An Environmental Review under 10 CFR 51 would also be required for facility impacts that include material storage and waste disposal (12-004).

12.3 Other Federal Regulatory Programs

The following subsections address major Federal laws and regulations likely to apply to construction and/or operation of the Atomic City site.

12.3.1 Air Emissions

The CAA was first promulgated in 1963 as PL 88-206. It has been amended several times since that date, with the most significant amendments occurring as the result of the CAA of 1970 (PL 91-604) and the CAA Amendments of 1990 (PL 101-549). The purpose of the CAA is to establish standards for the control of air pollution (12-028).

12.3.1.1 National Ambient Air Quality Standards

The CAA requires EPA to establish NAAQS for pollutants considered harmful to public health and the environment. The CAA established two types of NAAQS. Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against visibility impairment, damage to animals, crops, vegetation, and buildings (12-036).

The EPA has established NAAQS for six principal pollutants which are called "criteria" pollutants: PM_{10} and $PM_{2.5}$, carbon monoxide, sulfur oxides, nitrogen oxides, ground-level ozone, and lead. The NAAQS represent the maximum allowable concentrations measured in terms of local concentration of a pollutant in the atmosphere (12-036).

12.3.1.2 New Source Performance Standards

EPA is required under Section 111 of the CAA to establish New Source Performance Standards (NSPS) for each category of stationary sources that "causes, or contributes significantly to, air pollution which may reasonably be anticipated to endanger public health or welfare" (12-029). The NSPS program sets uniform emission limitations for industrial categories or sub-categories of sources and are intended to promote the use of best available air pollution control technologies. The NSPS are codified in 40 CFR 60. There are no NSPS that will apply to this project.

12.3.1.3 National Emission Standards for Hazardous Air Pollutants

The Section 112 of the CAA requires EPA to regulate emissions of 187 Hazardous Air Pollutants (HAPs) from a published list of industrial source categories. For these source categories, EPA has developed industry-specific technology requirements to control HAP emissions. These standards are known as NESHAPs. EPA has developed eight NESHAPs that address emissions of radionuclides to the atmosphere. However, these NESHAPs are industry specific, and no NESHAP has been promulgated for emissions from a nuclear power or processing facility (12-030, 12-032). None of these existing standards will be applicable at the Atomic City site.

12.3.1.4 Radioactive Emissions

Radionuclide air emissions from the proposed GNEP facility would be regulated by the NRC under 10 CFR 20 (12-146), which requires licensees to establish a dose constraint for air emissions of radionuclides.

12.3.1.5 New Source Review

NSR (12-148) is a preconstruction permitting program established under the CAA to ensure that air quality is not significantly degraded through the addition of new sources of air pollution. The NSR program requires all stationary sources of air pollution to obtain a permit prior to starting construction.

There are three types of NSR permitting requirements depending on the size of the facility and the attainment status of the area where the facility will be located. These are:

1. Prevention of Significant Deterioration (PSD), which includes permits for the construction of major sources of air pollutants or for facilities that are making a major modification to an existing source of air pollutants. For purposes of air permitting, a major source is defined as a source that has the potential to emit 100 tons per year or more of any regulated pollutant, 10 tons per year or more of HAP, or 25 tons per year of any combination of HAPs. PSD permitting also includes the requirement to demonstrate compliance with the PSD increment through the use of air transport modeling. The PSD increment is the amount of pollution an area is allowed to increase while still maintaining compliance with the NAAQS.

2. Nonattainment NSR, which applies to the construction of new major sources or major modifications of existing sources in a nonattainment area.

3. Minor source permitting, which applies to new sources and modifications of existing sources that emit air pollutants below the major source threshold. Facilities that have the potential to emit above the major source threshold but that take operating limits to lower their potential to emit below the major source threshold can also qualify for this permitting option. These sources are referred to as synthetic minor sources.

The Atomic City site is in attainment with ambient air quality standards; therefore, option two does not apply to this project. The final design and operating conditions for the project will determine if the facility will be a major source, minor source, or synthetic minor source.

12.3.1.6 Air Emission Operating Permits

Operating permits for sources of air pollutants are issued by EPA and state agencies to whom EPA has delegated permitting authority. Permitting authority within the State of Idaho has been delegated to IDEQ.

Permits for major sources are issued under 40 CFR 70 or corresponding state regulations, and are typically referred to as Title V operating permits in reference to Title V of the CAA (12-096). Operating permits for minor sources are issued in accordance with state regulations.

12.3.2 Wastewater and Storm Water Discharges

The CWA of 1977 establishes the basic structure for regulating pollution of surface waters of the United States (12-129). The CWA makes it unlawful for any person to discharge any pollutant from a point source into navigable waters, unless a permit is obtained under the Act’s provisions.

The CWA requires states to set water quality standards for all bodies of water within their boundaries and directs EPA and the states to regulate and issue permits for point-source discharges as part of the NPDES permitting program. Under the CWA, EPA has established a program whereby the EPA or individual states can issue permits for stormwater discharges related to industrial activity, including construction activities that could disturb 5 or more acres (40 CFR 122, (12-092). The CWA recognizes but does not regulate problems posed by nonpoint source pollution.

12.3.2.1 National Pollutant Discharge Elimination System

The NPDES permit program, established in Section 402 of the CWA, protects surface water quality by regulating point source discharges of pollutants to surface watercourses. As authorized by the CWA, the EPA NPDES permit program controls water pollution by regulating point sources that discharge pollutants into surface waters of the United States.

In Idaho, the NPDES permit program is administered by EPA, Region 10. An applicant may apply for either an individual or a general NPDES permit. An individual permit is specifically tailored to an individual facility, and a general permit covers multiple facilities with a specific category, such as storm water discharges (12-085). Permits specify the control technology applicable to each pollutant, the effluent limitations a discharger must meet, and the deadline for compliance. The permit incorporates numerical effluent limitations issued by EPA. Permittees are required to maintain records and carry out effluent monitoring activities. Permits are issued for 5-year periods and must be renewed thereafter to allow continued discharge (12-084).

Industrial Wastewater

Wastewater is spent or used water that contains enough harmful material, such as oil, dirt, human waste, and chemicals, to damage the water's quality. Any structure or facility that generates wastewater must dispose of it through a wastewater treatment and disposal system (12-115). Some industries may discharge their wastewater directly to a sanitary sewer, where it is conveyed to a wastewater treatment plant. This wastewater may be subject to pretreatment requirements under the wastewater treatment plant's NPDES permit (12-086). Sites not served by public sewer systems depend on decentralized, on-site septic systems to treat and dispose of wastewater (12-115). Industrial point sources of pollution that discharge wastewater directly to surface waters are required to obtain NPDES permits that limit the amount of pollution that may be discharged into surface waters (12-086).

Storm Water

The NPDES permit program includes an industrial stormwater permitting component adopted under Section 402 of the CWA. The NPDES General Permit for Industrial Stormwater regulates point source discharges of stormwater runoff from industrial and commercial facilities to waters of the United States. Since there are no waters of the United States within approximately 10 miles of the Atomic City site, it is questionable whether construction of GNEP facilities at the site would require coverage under an NPDES Stormwater General Permit for either construction or operation. Design, construction and operational details of facility storm water systems and stormwater pollution prevention plans should, however, be provided to EPA and IDEQ for review and possible determination that a permit is needed, or that the facilities can be excluded from the stormwater permitting requirement on the basis that there is no exposure of waters to pollution.

12.3.2.2 Permits for Dredged or Fill Material

Section 404 of the CWA gives the USACE permitting authority over activities that discharge dredge or fill material into waters of the United States. The Atomic City site activities should not discharge dredge or fill into any such waters. If the construction or modification of rail lines or highways to the site included dredge or fill activities or other actions that would discharge dredge or fill into waters of the United States, those activities would require Section 404 permits (12-149).

The USACE has the authority to make a jurisdictional determination as to the existence or absence of "waters of the United States" at the Atomic City site. Jurisdiction can be based on a determination that there are waters of the United States, navigable waters of the United States, or non-navigable, intra-state waters or wetlands that could affect the water quality of navigable waters. A decision that a jurisdictional determination is not required would provide an analysis by the USACE as to whether waters of the United States could be affected by GNEP activities at the Atomic City site.

12.3.2.3 Floodplain Assessment

Floodplains are lands that are subject to periodic flooding. Often, they occur where annual water flow is low or non-existent, but they may also occur due to large amounts of melting snow or rainfall that run off the land. A 100-year floodplain is any land area that is subject to a 1 percent or greater chance of flooding in any given year from any source (12-023).

As discussed in Section 11, *Hydrology/Flooding*, the Atomic City site is demonstrated to be above the 100-year flood plain. In addition, the site is remote from any perennial surface water feature. The Big Lost River, located 9.5 miles from the Atomic City site, is the closest significant water body, but it has stream flow only in years of abundant snow pack.

The USGS, U.S. BOR, and DOE have evaluated the potential for flooding along the Big Lost River, and this information is addressed in Section 11, *Hydrology/Flooding*. The Snake River, located approximately 25 miles from the Atomic City site, is the closest significant perennial water body. The USGS 7.5 minute topographic map (12-144) identifies several small ephemeral streams near the Atomic City site, which are anticipated to contain water only after storm events or during snowmelt. Information needed to calculate potential flooding due to runoff in ephemeral drainages from local storms and snowmelt is contained in Section 11, *Hydrology/Flooding*. As detailed in Section 11.1, the site is located more than 9 miles from the nearest 100-year floodplain identified in the FEMA FIRM or other DOE-commissioned studies, and remote from any perennial surface water feature. It was therefore determined that the Atomic City site is not subject to flooding due to the MPF of the Big Lost River.

12.3.3 Natural Resources Protection

There are three designations given to species under the ESA of 1973, as amended, which offer protection to plants and animals that have been found to warrant protective measures to ensure their survival and existence (12-109). These designations are that of endangered, threatened, or candidate species, which are further described in Section 5, *Threatened or Endangered/Special Concern Species*. An endangered species is an animal or plant species in danger of extinction throughout all or a significant portion of its range. A threatened species is an animal or plant species likely to become endangered within the foreseeable future throughout all or a significant portion of its range; and a candidate species is a plant or animal species for which USFWS or NOAA Fisheries has on file sufficient information on biological vulnerability and threats to support a proposal to list as endangered or threatened.

A species of concern is an informal term used by USFWS and NOAA Fisheries as well as many state agencies (such as IDFG) that refers to a species that might be in need of conservation action or is considered sensitive, rare, or declining on lists maintained by Natural Heritage Programs, state wildlife agencies, other Federal agencies, or professional/academic scientific societies. This may range from a need for periodic monitoring of populations and threats to the species and its habitat, to the necessity for listing as threatened or endangered. Such species receive no legal protection and use of the term does not necessarily imply that a species will eventually be proposed for listing.

12.3.3.1 Endangered Species Act Section 7 Consultation

The ESA is intended to provide a means to conserve the ecosystems upon which endangered and threatened species depend and provide programs for the conservation of those species, thus preventing extinction of plants and animals. The law is administered by USFWS and NOAA Fisheries, depending on the species. Section 7 of the ESA requires all Federal agencies, in consultation with USFWS or NOAA

Fisheries, to use their authorities to further the purpose of the ESA and to ensure that their actions are not likely to jeopardize the continued existence of listed species or result in destruction or adverse modification of critical habitat.

The interagency cooperation requirements of Section 7(a)(2) of the ESA are to be carried out in consultation with the Secretary of the Interior, via the USFWS. The need to initiate consultation is usually determined by the governing federal agency, which in the case of the GNEP facilities is the DOE, and is based on an analysis to determine if an individual of a federally listed species, or its designated critical habitat, may be affected by a proposed action. The DOE must initiate consultation if a listed species is known, or suspected, to occur on land that will be affected by an action, and the DOE determines that individuals, populations, or designated critical habitat of threatened or endangered species may be affected by the action, either positively or negatively.

12.3.3.2 Biological Opinion

The consultation results in a biological opinion by USFWS or NMFS determining whether the proposed action would jeopardize the continued existence of the species under consideration, or result in destruction or adverse modification of critical habitat. If jeopardy is not found, but some individuals may be incidentally killed as a result of the proposed action, the services can determine that such losses are acceptable if specified measures are followed.

Sixty-four special status species have been identified as occurring in Butte and Bingham Counties. These species are presented in Section 5, *Threatened or Endangered/Special Concern Species*. There is suitable or marginally suitable habitat present within or adjacent to the Atomic City site for only 14 of these species. Six other federally listed species are also discussed in Section 5; however, these are not likely to occur within the Atomic City site.

12.3.4 Historical, Tribal, and Cultural Resources Protection

This subsection addresses Federal laws and regulatory programs for the preservation of historical, tribal, and cultural resources. Historical, Archaeological, and Cultural Resources are further described in Section 7, *Historical, Archaeological, and Cultural Resources*.

12.3.4.1 National Historic Preservation Act

The NHPA (12-111) was enacted to create a national historic preservation program, including the NRHP and the Advisory Council on Historic Preservation. The NHPA provides for the placement of sites with significant national historic value on the NRHP. It requires no permits or certifications.

12.3.4.2 Archaeological and Historic Preservation Act

The AHPA of 1974, as amended, 16 U.S.C. 469-469c (12-105), as amended, provides for the preservation of historic and archaeological data that would otherwise be lost as a result of federal construction. The AHPA authorizes the U.S. Department of the Interior to undertake recovery, protection, and preservation of archaeological and historic data. Section 4(a) of the AHPA requires that the Secretary of the Interior be notified when unanticipated archaeological materials are discovered during construction of a federal project. Section 7(a) limits the amount of funds expended for archaeological data recovery to 1 percent of project expenses. Section 208 of the 1980 amendment of the NHPA establishes a procedure for agencies to request the Secretary of the Interior to waive the 1 percent limitation. Application of the AHPA to construction of GNEP facilities would be dependent on whether construction of the facilities would be considered a federal undertaking.

12.3.4.3 Archaeological Resources Protection Act

The Archaeological Resources Protection Act of 1979, as amended (16 U.S.C. 470aa et seq.) (12-106) secures the protection of archeological resources and sites on public or Indian lands, and fosters exchange of information between agencies, organizations and individuals having collections or data. The Act requires individuals to obtain a permit from the federal land manager for any excavation or removal of archeological resources from public or Indian lands. Excavations must further archaeological knowledge in the public interest. Any resources removed remain the property of the U.S. This Act would apply to GNEP activities on the Atomic City site only in the event that activities affected archaeological resources on federal land adjacent to the site in a manner that created the potential for excavation or removal.

12.3.4.4 Antiquities Act

The Antiquities Act (16 U.S.C. 431 et seq.) (12-104) protects historic and prehistoric ruins, monuments, and objects of antiquity (including paleontological resources) on lands owned or controlled by the Federal Government. If historic or prehistoric ruins or objects were found on adjacent federal land during the construction or operation of the Atomic City site, a determination of whether adverse effects to these ruins or objects would occur. If adverse effects would occur, the Secretary of the Interior would have to grant permission to proceed.

12.3.4.5 American Indian Religious Freedom Act

The American Indian Religious Freedom Act (12-103) affirms Native American religious freedom and establishes policy to protect and preserve the inherent and constitutional right of Native Americans to believe, express, and exercise their traditional religions. This law ensures the protection of sacred locations and access of Native Americans to those sacred locations and traditional resources that are integral to the practice of their religions. Further, it establishes requirements that would apply to Native American sacred locations, traditional resources, or traditional religious practices potentially affected by the construction and operation of projects requiring federal action.

The Act directed federal agencies to evaluate policies and procedures, consulting with native traditional religious leaders, to determine changes needed to implement the Act. One of the resulting changes was Executive Order 13007, Indian Sacred Sites (12-108). This Order directs Federal agencies to avoid adverse effects to sacred sites and to provide access to those sites to Native Americans for religious practices to the extent permitted by law and not inconsistent with agency missions. Executive Order 13007 directs agencies to plan projects to provide protection of and access to sacred sites to the extent compatible with the project.

12.3.4.6 Native American Graves Protection and Repatriation Act

The Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001) directs the Secretary of the Interior to guide the repatriation of Federal archaeological collections and collections that are culturally affiliated with Native American tribes and held by museums that receive Federal funding (12-110). Major actions to be taken under this law include 1) the establishment of a review committee with monitoring and policymaking responsibilities, 2) the development of regulations for repatriation, including procedures for identifying lineal descent or cultural affiliation needed for claims, 3) the oversight of museum programs designed to meet the inventory requirements and deadlines of this law, and 4) the development of procedures to handle unexpected discoveries of graves or grave goods during activities on Federal or tribal land. The provisions of the Act would be invoked if any GNEP-related excavations on federal land adjacent to the Atomic City site led to unexpected discoveries of Native American graves or grave artifacts.

12.3.4.7 Executive Order 13175, Consultation and Coordination with Indian Tribal Governments

Executive Order 17135 (12-099) directs Federal agencies to establish regular and meaningful consultation and collaboration with tribal governments in the development of Federal policies that have tribal implications, to strengthen U.S. government-to-government relationships with Indian tribes, and to reduce the imposition of unfunded mandates on tribal governments. It would apply to the extent that development and operation of the Atomic City site had potential consequences for tribes.

12.3.5 National Environmental Policy Act

NEPA (42 U.S.C. § 4321 et seq.), as amended (12-140) establishes environmental policy and goals for the protection, maintenance, and enhancement of the nation's environment to ensure for all Americans a safe, healthful, productive, and aesthetically and culturally pleasing environment. NEPA provides a process for implementing these specific goals within Federal agencies responsible for specific actions. Council on Environmental Quality regulations (40 CFR 1500 through 1508) (12-141) set out general guidelines for implementing NEPA requirements during review of all proposed federal actions, including licensing of nuclear facilities, approval of sites for those facilities, and use of nuclear materials.

Individual federal agencies have also adopted implementing regulations. DOE's NEPA implementing regulations are found at 10 CFR 1021 (12-147). NRC's NEPA implementing regulations are found at 10 CFR 51 (12-004).

12.3.6 Federal Land Policy and Management Act

The FLPMA of 1976 (43 U.S.C. 1701 et seq.) (12-142) governs the use of Federal lands administered by the BLM. Access to and use of public lands administered by the Bureau are primarily governed by the regulations regarding the establishment of rights-of-way (43 CFR 2800) (12-098) and withdrawals of public domain land from public use (43 CFR 2300) (12-097). It could have application to the Atomic City site if utility or transportation routes across adjacent federal land were required for construction or operation of GNEP facilities.

12.3.7 Hazardous Materials Packaging and Transportation

Both the U.S. Department of Transportation (DOT) and the NRC regulate the safe transportation of radioactive materials. The DOT is responsible for transportation safety standards for hazardous materials, including radioactive materials. The NRC regulates packaging- and transportation-related operations of its licensees, which include commercial shippers of radioactive materials. The NRC sets design and performance standards for packaging (shipping casks) that carry materials with higher levels of radioactivity. DOT accepts NRC packaging standards set out at 10 CFR 71 (12-093).

12.3.7.1 Hazardous Materials Transportation Act

The Hazardous Materials Transportation Act (49 U.S.C. 1801) (12-102) authorizes DOT to regulate hazardous materials transportation, including the transportation of radioactive materials. DOT requires identification of hazardous materials during transportation, regulates route selection, and provides guidance to states in selecting preferred routes.

12.3.7.2 Department of Transportation Hazardous Materials Packaging and Transportation Regulations

DOT regulates the shipments of hazardous materials, including spent nuclear fuel and high-level radioactive waste, in interstate and intrastate commerce by land, air, and navigable water (49 CFR 171 through 180) (12-100). DOT regulates spent nuclear fuel carriers, as well as conditions of transport, e.g., routing, handling, storage, and vehicle and driver requirements. It also regulates labeling, classification, and marking of transportation packages for radioactive materials. DOT regulations include requirements for carriers, drivers, vehicles, routing, packaging, labeling, marking, placarding of vehicles, shipping papers, training, and emergency response, and specifications for maximum dose rates and maximum allowable levels of radioactive surface contamination on packages and vehicles.

DOT routing regulations (49 CFR 397) (12-101) are intended to reduce the impacts of transporting radioactive materials, to establish consistent requirements for route selection, and to establish terms for state and local participation in route selection.

12.3.7.3 Nuclear Regulatory Commission Radioactive Materials Packaging and Transportation Regulations

The NRC regulates packaging and transport of spent nuclear fuel for its licensees, including commercial shippers and federal carriers (10 CFR 71) (12-093). The NRC also sets standards for Type B packages, including packages carrying spent nuclear fuel. Type B packages are designed and built to retain their radioactive contents in both normal and accident conditions.

The NRC also sets standards for safeguards and physical security during the shipments of spent nuclear fuel (10 CFR 73) (12-094). These regulations include requirements for vehicles, carrier personnel, communications, notification of states, escorts, and route planning.

12.3.8 Emergency Planning and Community Right-to-know Act

EPCRA (12-123) requires facilities to provide information on certain hazardous and toxic materials to state emergency response agencies, local emergency service providers, and EPA. EPCRA is intended to promote the ability of emergency providers to respond to unplanned releases of hazardous substances.

Sections 311 and 312 of EPCRA require facilities with regulated quantities of hazardous substances on site to provide an inventory of certain hazardous substances to the State Emergency Response Commission, Local Emergency Planning Committee, and the local fire department. EPCRA does not place limits on which chemicals can be stored, used, released, disposed, or transferred at a facility. It only requires a facility to document, notify, and report information (12-125).

Section 313 of EPCRA requires facilities that meet certain threshold requirements to report releases to the environment and off-site transfers of certain listed chemicals. This Toxic Release Inventory Report must be submitted to both EPA and IDEQ; however, EPA is predominantly responsible for implementation of EPCRA Section 313.

The requirements set forth in the EPCRA are only applicable during facility operations.

12.4 State Regulatory and Permitting Requirements

This section addresses Idaho regulatory and permitting requirements that may apply to the Atomic City site if selected for siting of GNEP facilities.

12.4.1 Idaho Construction Permits

This section describes the state permit requirements for design and construction of industrial facilities that would be located at the Atomic City site in support of GNEP.

12.4.1.1 Building Permit

Title 39, Chapter 41 of the Idaho Code, the Idaho Building Code Act, requires the uniformity of building codes and uniformity in procedures for enforcing building safety codes. It also contains minimum performance standards and requirements for construction and construction materials. It states that it is unlawful for any construction in the State of Idaho to occur without a permit (12-008).

Upon approval and in accordance with Idaho Statute Title 54, Chapter 52, Section 9, all building permits or other permits for construction of any type must be posted in a visible location at the construction site (12-010).

12.4.1.2 Other Permits

The IDBS promotes the health, safety, and welfare of the citizens of Idaho by ensuring compliance with statewide building, energy conservation, public works, industrial safety, electrical, and plumbing standards and regulations. They oversee three permits required for construction: electrical; plumbing; and HVAC. These permits are typically obtained by the certified and/or licensed contractors performing construction activities in their areas of expertise.

The electrical permit is issued by IDBS Electrical Bureau. Every permit issued by the Electrical Bureau expires if the work authorized by the permit does not commence within 90 days from the date of issuance (12-051).

The plumbing permit is issued by IDBS Plumbing Bureau. Title 54, Chapter 26 of the Idaho Code specifies that a permit is required for any construction, installation, or improvement of any plumbing system in any building, residence or structure, or service lines thereto, in the State of Idaho (12-054). Every permit issued by the Plumbing Bureau expires if the work authorized by the permit does not commence within 120 days from the date of issuance (12-055).

The HVAC permit is issued by the IDBS HVAC Bureau. Rules governing the installation of HVAC systems have been established in the Idaho Administrative Code (IDAPA 07), Title 7, Chapter 1 (12-053) and Title 54, Chapter 50 of the Idaho Statutes (12-052). Specifically, these rules specify that a permit must be obtained for any construction, installation, or improvement of any HVAC system in any building, residence, or structure in the State of Idaho. Every permit issued by the HVAC Bureau expires if the work authorized by the permit does not commence within 90 days from the date of issuance (12-052).

12.4.2 Idaho Air Quality Program

IDEQ has been delegated authority by EPA to implement the requirements of the CAA in accordance with Idaho's SIP (12-033, 12-035). The requirements for permitting sources of air emissions in the State of Idaho are addressed in this subsection.

12.4.2.1 Proposed Site Attainment Status

The IDEQ maintains an ambient air-monitoring network with monitoring sites at more than 20 locations throughout the state. In addition, integrated sampling methods are used at another 10 sites. The data collected from these monitoring sites are used primarily to define the nature and level of pollution in the State of Idaho, determine which areas are meeting the air quality standards, and identify pollution trends in the state (12-143).

The CAA requires that EPA assign a designation of each area of U.S. regarding compliance with the NAAQS. The level of compliance or noncompliance is categorized by EPA as follows:

- Attainment – Area currently meets the NAAQS.
- Maintenance – Area currently meets the NAAQS, but has previously been out of compliance.
- Nonattainment – Area currently does not meet the NAAQS.

The Atomic City site and surrounding area are currently in attainment with all NAAQS. There is only one nonattainment area within a 50-mile radius of the Atomic City site. The nonattainment area includes 96.6 square miles in Bannock County. This nonattainment area is approximately 35 miles south of the Atomic City site and includes federal land managed by the BLM and the Caribou National Forest, as well as privately owned land in the cities of Pocatello and Chubbuck.

The pollutant for which this area has been designated as nonattainment is PM_{10}, which is particulate matter less than or equal to 10 microns in diameter. The primary source of this pollutant is phosphate mining and phosphate mills. Some secondary sources include residential wood burning and fugitive road dust (12-143).

12.4.2.2 Idaho Air Permits

Under the CAA and the Rules for Control of Air Pollution in Idaho, any business or industry in Idaho that emits or has the potential to emit pollution into the air is required to have an air pollution control permit. Air permits are issued when a new source is constructed and begins operation, or when an existing source modifies any of its processes that emit or have the potential to emit air pollutants. IDEQ permits require sources of air pollution to comply with all health and technology based standards established by EPA and the Rules for Control of Air Pollution in Idaho (12-038). If an applicant demonstrated compliance with all applicable federal and state air pollution laws and regulations, IDEQ is required by law to issue an air permit. IDEQ issues four types of air quality permits, as outlined in Table 12-2.

Table 12-2. Summary of IDEQ air quality permits (12-037).

Permit Type	General Applicability	Applicability to the Atomic City Site
Permit to Construct (PTC)	Required prior to construction or modification of stationary sources that emit or have the potential to emit pollutants into the air. A PTC is also required for certain portable equipment such as generators, crushing equipment, asphalt plants, and concrete batch plants.	Will be required prior to construction of any sources of air pollutants. See Idaho Air Construction Permit discussion for details.
Tier I Operating Permit	A Tier I Operating Permit (also known in the Federal regulations as a Title V operating permit) is required for major sources of air pollution. A major source is defined as a source that emits or has the potential to emit 100 tons per year or more of any regulated air pollutant, 10 tons per year or more of any HAP, or 25 tons per year or more of any combination of HAPs. Minor sources (those that emit less than the limits specified for a major source) that are subject to an NSPS or NESHAP may be required to obtain a Tier I permit.	The GNEP facilities could potentially be a major source of air pollutants and, therefore, would require a Tier I permit. The project will not be subject to any NSPS or NESHAP. See Idaho Operating Permits discussion for details on Tier I Operating Permits.
Tier II Operating Permit	A Tier II Operating Permit is required for sources of air pollution that have the potential to emit air pollutants at a rate of less than the major source thresholds (minor sources) or those sources that take operating limits that lower their potential to emit below the major source threshold (synthetic minor sources).	The GNEP facilities could have the potential to emit air pollutants below the major source threshold or could take federally enforceable permit conditions to limit the potential to emit below the major source threshold. In either of these cases, a Tier II permit would be required. See Idaho Operating Permits discussion for details on Tier II Operating Permits
Permit by Rule (PBR)	A PBR is a streamlined permitting process that applies to portable rock crushing facilities.	The PBR is not expected to apply to the GNEP facilities.

Idaho Air Construction Permits

The IDEQ requires a permit prior to the initiation of construction or modification for any source of air pollutants. Requirements for construction permitting are contained in the Rules for Control of Air Pollution in Idaho (IDAPA 58.01.01.200 et seq.) (12-038).

Air modeling is required by the State of Idaho to demonstrate compliance with the NAAQS, toxic air pollutant (TAP) standards, and PSD increment. The purpose of air modeling is to demonstrate that all ambient air quality standards will be met if the GNEP facilities are completed. IDEQ has developed the State of Idaho Air Quality Modeling Guidelines (12-037) to assist air permit applicants in understanding the state's modeling requirements.

Idaho does allow for certain facilities to start construction prior to the issuance of the PTC (12-038). This 15-Day Pre-permit Construction Approval is applicable only to sources that satisfy the following conditions:

1. Have completed a comprehensive air quality assessment and regulatory review,
2. Are not proposing a new major facility or a major modification of an existing facility,
3. Are not utilizing emissions offsets in the permitting process, and
4. Are willing to commence construction at their own risk recognizing that their PTC application may ultimately be denied or may be issued with unacceptable operating limits and they will not be allowed to operate the source.

This permitting option will most likely not apply at the Atomic City site because the potential emissions may exceed the major source threshold. Furthermore, other permits, particularly those from the NRC, will have longer lead times negating the need to expedite the PTC.

Idaho Operating Permits

As indicated in Table 12-2, Idaho has a two-tier system for air operating permits.

Tier I Operating Permit

Idaho's Tier I Operating Permit is similar to EPA's Title V Operating Permit and applies to major sources of air pollution. The Tier I Operating Permit is also required for sources that are subject to NSPS or NESHAPs. The requirements for Tier I Operating Permits are contained in IDAPA 58.01.01.300 et seq. (12-038).

Tier I facilities are required to report to IDEQ every six months on their status of compliance with the conditions of their permit.

Tier II Operating Permit

Facilities that have the potential to emit air pollutants at less than the major source threshold and those facilities that take federally enforceable permit conditions to limit the potential to emit below the major source threshold qualify for the Tier II Operating Permit. The requirements for Tier II Operating Permits are contained in IDAPA 58.01.01, 400 et seq. (12-038). Air modeling may be required for certain Tier II permits.

Idaho Air Toxics

Air toxics are regulated by both state and federal programs. Idaho's Air Toxics Program regulates approximately 350 TAPs, while EPA's federal NESHAP program regulates 187 HAPs. Both TAPs and HAPs are referred to as air toxics (12-030, 12-038).

Idaho's TAP Program is a stand-alone risk-based program that regulates approximately 350 pollutants determined by their nature to be toxic to human or animal life or vegetation. Idaho's regulations prohibit emission of these contaminants alone or in combination with other contaminants in amounts that would injure or unreasonably affect human or animal life or vegetation.

TAP emission limits from industrial sources are limited by acceptable ambient concentrations (AACs) for carcinogenic and non-carcinogenic pollutants and by screening emission levels for non-carcinogens. AACs are the maximum concentration levels allowed in the outside air from a pollution source or sources under construction or modification. Compliance is often verified by computer modeling or ambient air sampling. AACs for non-carcinogens are 24-hour averages. These levels can be found in IDAPA 58.01.01.585. Acceptable ambient concentrations for carcinogens (AACCs) are annual averages. These levels can be found in IDAPA 58.01.01.586.

Emission levels are stack-based emission levels based on pounds of each pollutant emitted per hour. Compliance is often verified by engineering calculations, computer modeling, or stack sampling. Emission levels for non-carcinogens can be found in IDAPA 58.01.01.585, while emission levels for carcinogens can be found in IDAPA 58.01.01.586.

If a new or modified source emits an air toxic that is regulated by both Idaho's program and EPA's HAP program, then the source is exempt from the state program for the specific pollutant regulated by the federal standard. If the source emits additional TAPs not covered under the applicable federal standard, then the source is subject to the state regulations for those pollutants.

12.4.3 Wastewater and Water Quality

As discussed above, EPA Region 10 retains NPDES permitting authority within the State of Idaho. IDEQ is responsible for permitting land application of wastewater as well as for issuing a water quality certification in accordance with Section 401 of the CWA for all NPDES permits issued in Idaho. These two state wastewater requirements are discussed below.

12.4.3.1 Wastewater Reuse Permit

Land application of wastewater is one method of reusing treated wastewater. It is a natural way of recycling by which wastewater is applied to land for irrigation and is assimilated into the soil structure (12-131). The *Rules for Reclamation and Reuse of Municipal and Industrial Wastewater* (IDAPA 58.01.17) require a wastewater reuse permit prior to constructing, modifying, or operating a wastewater reuse facility in the state (12-081). These rules state that no person shall construct, modify, operate, or continue to operate a reclamation and reuse facility and no person shall discharge to such a facility without a valid permit issued by the IDEQ. At least 180 days prior to construction, a permit application must be submitted (12-082).

The evaluation for approval to apply wastewater material to the land surface, to bury wastewater material, or to recharge water in the upper soil horizon is based on the following:

- The type and quantity of wastewater,
- The nature of the soils and geologic formations underlying the site, and
- The ability of the soil and vegetative cover on the application site to remove the pollutants contained in the applied waters (12-081).

Wastewater reuse permits specify site-specific loading rate limits and monitoring requirements to protect public health, surface water, and ground water quality, and to manage odor (12-039). They specify that the application of wastewater or recharge waters to the land surface is restricted to the premises of the application site, and monitoring the quality of the ground water must be in proximity of the application site. The permit is effective for 5 years, after which the permittee is responsible for applying for a new permit to continue operation (12-082).

12.4.3.2 Water Quality Certification (Section 401)

The State of Idaho's role in this process is to certify that NPDES-permitted projects comply with state water quality standards (12-086) in accordance with Section 401 of the CWA, which is implemented in 40 CFR 121 (12-117). IDEQ is the state agency responsible for implementing the Section 401 certification process (12-039).

After EPA issues a draft permit and provides public notice, the agency provides the proposed final permit to the IDEQ for certification. The IDEQ usually has 30 days to issue or deny its certification. CWA Section 401 certification is required for any permit or license issued by a federal agency for any activity that may result in a discharge into waters of the state to ensure that the GNEP facilities will not violate state water quality standards. The IDEQ must grant, deny, or waive §401 certification for a project before a federal permit or license can be issued (12-112).

12.4.4 Drinking Water, Well Drilling and Underground Injection

The SDWA was originally passed by Congress in 1974 to protect public health by regulating the nation's drinking water supply. The SDWA authorizes EPA to set national health-based standards for drinking water to protect against both naturally occurring and man-made contaminants that may be found in drinking water. EPA, states, and water systems then work together to make sure that these standards are met (12-068). Idaho has been authorized by EPA to implement the SDWA requirements in Idaho.

EPA sets national standards for drinking water; provides guidance, assistance, and public information about drinking water; collects drinking water data; and oversees state drinking water programs. Primary drinking water regulations and regulations applicable to drinking water systems are promulgated in 40 CFR 141 through 143 (12-069, 12-070, and 12-071). 40 CFR 141 specifies siting requirements for construction of a new drinking water system at a site that is subject to significant risk from earthquakes, floods, fires, or other disasters or that is within the floodplain of a 100-year flood. In addition, regulations pertaining to the maximum permissible level of a contaminant in water, and monitoring and analytical requirements are published in 40 CFR 141 and are implemented and enforced in 40 CFR 142. The National Secondary Drinking Water Regulations control contaminants in drinking water primarily affected by aesthetic qualities relating to the public acceptance of drinking water and are promulgated in 40 CFR143.

To implement these requirements on a state level, the *Idaho Environmental Protection and Health Act* (Idaho Code Chapter 1, Title 39) (12-076) gives the IDEQ the authority to promulgate rules governing quality and safety of drinking water (IDAPA 58.01.08) (12-075). The IDWR is the state agency delegated responsibility by EPA to implement the SDWA. States ensure that water systems test for contaminants, review plans for water system improvements, conduct on-site inspections and sanitary surveys, provide training and technical assistance, and take action against water systems not meeting standards (12-068). In addition, a state has primary enforcement responsibility for drinking water systems in the state (12-070).

12.4.4.1 Drinking Water System Approval

The SDWA applies to every public drinking water system in the U.S. (12-068). A public drinking water system is defined as one that has 15 or more service connections or serves 25 or more persons per day for at least 60 days per year. Therefore, drinking water provided at the GNEP facilities will be governed by the SDWA as a public drinking water system. Rules governing quality and safety of drinking water in Idaho have been promulgated in IDAPA 58.01.08. No person may construct a drinking water system until it is demonstrated to the IDWR that the water system will have adequate technical, financial, and managerial capacity (12-075). In addition, all plans and specifications for the construction of new water supply systems must be submitted to and approved by the IDWR before construction may begin (12-076). Further, prior to drilling a water system well, the site must be approved by the IDWR.

The IDWR has statutory responsibility for all water wells. A drilling permit must be obtained from the IDWR before the construction of any well greater than 18 feet in depth. The drilling permit is valid for 2 months from the approval date for the start of construction. The well is required to be constructed by a driller currently licensed in the State of Idaho, who must maintain a copy of the drilling permit at the drilling site (12-077).

The IDWR requires facility owners of drinking water systems to place the direct supervision and operation of their systems under a properly licensed operator (12-075). All drinking water systems are also required to have a licensed backup or substitute operator. Operators are licensed by the Idaho State Board of Drinking Water and Wastewater Professionals (12-078).

Systems serving fewer than 10,000 persons are considered to be small systems. IDAPA 58.01.08.005 (02)(b) and 40 CFR 142 provide authorization for obtaining variances from the requirement to comply with MCL or treatment techniques to systems serving fewer than 10,000 persons. These provisions may apply to the GNEP facilities.

12.4.4.2 Well Drilling Permit

Idaho requires that a permit application to drill a well be approved by staff of the IDWR The information required on the application includes the well location, proposed use, and well construction methods. Wells must be drilled by persons holding a driller's license from the IDWR. Wells must also comply with Idaho's well construction standards found at IDAPA 37.03.09. (12-077).

12.4.4.3 Underground Injection Control

In addition to direct protection of potable water systems, the SDWA sets a framework for the Underground Injection Control (UIC) program to regulate underground injection of contaminants into ground water (12-068). The State of Idaho's UIC program, approved by EPA in February 1985, is administered by the IDWR (12-074) in accordance with the Waste Disposal and Injection Well Statute (Idaho Code Chapter 39, Title 42) (12-079) and the *Rules and Minimum Standards for the Construction and Use of Injection Wells in the State of Idaho* (IDAPA 37.03.03) (12-080).

The UIC Permit Program regulates underground injections by five classes of wells, which are described in IDAPA 37.03.03.025 (01) and 40 CFR 144.6, 144.80, and 146.5 (12-080, 12-072, and 12-073). The *Rules and Minimum Standards for the Construction and Use of Injection Wells in the State of Idaho* (IDAPA 37.03.03) prohibit the permitting, construction, or use of any Class I, II, III, or IV injection well (12-080). Shallow Class V injection wells, used to place a variety of fluids, such as storm runoff, directly below the land surface, are authorized by rule and do not require a permit (12-072). Construction and use of Class V deep injection wells may be authorized by permit (12-080).

In Idaho, excess storm water and facility heating/cooling water is frequently eliminated from the surface through injection devices such as wells or drain fields. The IDWR regulates the construction, operation and abandonment of injection wells through the Idaho Injections Well Program and requires a permit for these activities (12-077). However, no injection will be authorized if it results in the movement of fluid containing a contaminant into underground sources of drinking water at levels that violate any primary drinking water regulation in 40 CFR 141 (12-072).

Any underground injection, except into a well authorized by rule or by permit, is prohibited. In addition, the construction of any well required to have a permit is prohibited until the permit has been issued. The permit application requirements are specified in IDAPA 37.03.03 and 40 CFR 144. Permits are effective for a period of 10 years (12-072).

Technical criteria and standards pertaining to UIC wells are specified in 40 CFR 146 (12-073). Construction, operating, monitoring, reporting, corrective action, and closure requirements are contained within this part. As a condition of authorization, all owners or operators of shallow Class V injection wells are required to submit a Shallow Injection Well Inventory Form to the IDWR no later than 30 days prior to the commencement of construction for each new well (12-080).

Injection wells represent potential hazards to groundwater resources through direct or indirect activities. An injection well permit does not release the well owner and/or operator from mitigation, cleanup, and legal fees in the event that contamination is caused through an injection well (12-077).

12.4.5 Hazardous and Solid Waste Management

The Solid Waste Disposal Act (SWDA), as amended by the Resource Conservation and Recovery Act (RCRA) and the Hazardous and Solid Waste Amendments (HSWA) of 1984, regulates the treatment, storage, and disposal of hazardous and non-hazardous waste. EPA has developed regulations implementing the hazardous waste portions of RCRA and HSWA. These Federal regulations, which are contained in Title 40 of the CFR 260 through 272, are designed to address all aspects of hazardous waste management from “the cradle to the grave” (12-045).

Idaho is authorized to implement most elements of the RCRA regulatory program, with the exception of certain closure and post-closure care portions (12-064). These non-authorized portions will not impact the ability of the Atomic City site to be permitted by the IDEQ for hazardous waste management.

To implement the RCRA requirements, the Idaho Legislature enacted the Hazardous Waste Management Act of 1983 (Idaho Code Chapter 44, Title 39) (12-016). The IDEQ has adopted Rules and Standards for Hazardous Waste, IDAPA 58.01.05 (12-014) to regulate the management of hazardous waste in the State of Idaho. These regulations adopt by reference the Federal RCRA regulations contained in 40 CFR 124, 260-266, 268, 270, 273, and 279 as they appear in Title 40 of the CFR, revised as of July 1, 2005.

IDEQ’s Waste Management and Remediation Division is responsible for implementing and enforcing rules and regulations governing the generation, treatment, storage, and disposal of wastes. This Division issues permits, oversees inspections of facilities that generate hazardous waste, provides technical assistance, and takes corrective action, when necessary, to ensure that hazardous wastes are managed and disposed of properly and safely in Idaho (12-047).

In the case of mixed waste, that is, waste that contains both hazardous and radioactive components, the state has jurisdiction only over the hazardous component of the waste. States such as Idaho, that are authorized to implement the RCRA program in lieu of EPA may only "apply the RCRA regulations to the hazardous component of mixed waste, regardless of the classification of the radioactive component as low-level, high-level, transuranic, or other" (12-139).

12.4.5.1 Hazardous Waste Facility Siting Criteria

Idaho has adopted the federal regulations governing the location of new hazardous waste facilities that are contained in 40 CFR 264.18 and 270.14(b)(11) (12-011, 12-012, 12-025). These regulations place restrictions on siting new facilities, including restrictions on locating facilities in environmentally sensitive areas (12-022). Section 264.18 specifically prohibits the location of a new hazardous waste TSDF in the following locations:

- Within 200 feet of a fault that has had displacement in Holocene time (40 CFR 264.18(a)),
- Within a 100-year floodplain unless the facility is designed, constructed, operated, and maintained to prevent washout of any hazardous waste by a 100-year flood or other specific provisions are met (40 CFR 264.18(b)), or
- In a salt dome if the waste being placed is a non-containerized or bulk liquid (40 CFR 264.18(c)).

The characteristics of the Atomic City site meet these location requirements.

The State of Idaho Legislature enacted the *Hazardous Waste Facility Siting Act* (Idaho Code Chapter 39, Title 58) to provide an effective method of establishing safe sites with adequate capacity for the disposal of hazardous waste (12-015). Under this Act, owners and operators of prospective TSDFs are required to obtain a siting license demonstrating that the facility complies with the state’s hazardous waste management plan (12-040). These regulations specify the process for obtaining a site license for a hazardous waste facility. This act does not contain specific prohibitions restricting the location of a hazardous waste facility. Furthermore, Section 38-5816 states, “An ordinance, permit requirement or other requirement of a city or county shall not prohibit the construction of a hazardous waste treatment, storage, or disposal facility in that city or county” (12-015).

It is the intent of the Idaho Legislature that the site license process not duplicate the existing *Hazardous Waste Management Act* permitting process specified in Idaho Code Chapter 44, Title 39. The siting license, issued by the IDEQ, is a preliminary, general review that is not based on the same level of detailed technical information required for the hazardous operating permit (12-015). The license is required prior to construction, expansion, or alteration of a commercial hazardous waste disposal, treatment or storage facility (12-015).

Section 39-5808 of the Hazardous Waste Siting Act states that, “The owner or operator of the facility or site rather than the builder shall be responsible for obtaining the license.” A siting license fee, not to exceed $7,500, accompanies the siting application and is based on site size, projected waste volume, and hydrogeologic characteristics surrounding the site (12-014, 12-015, 12-040).

No hazardous waste permit shall be issued unless the applicant has been issued a site license (12-015).

12.4.5.2 Treatment, Storage, and Disposal Facility Operating Permit

In accordance with the *Hazardous Waste Management Act* (Idaho Code Chapter 44, Title 39) and the *Idaho Rules and Standards for Hazardous Waste* (IDAPA 58.01.05), no person shall treat, store, or dispose of hazardous waste and no person shall construct, operate, or modify a hazardous waste TSDF unless that person has a permit for the specific activity involved (12-014, 12-016). The hazardous waste permitting program, promulgated by EPA under RCRA and enforced by the State of Idaho, helps ensure the safe treatment, storage, and disposal of hazardous wastes by establishing specific requirements that must be followed when managing those wastes (12-021). A permit is required for facilities that store hazardous waste on-site for greater than 90 days, treat or dispose of hazardous waste on-site, or receive hazardous waste from off-site locations.

The federal regulations governing the permitting process are found in 40 CFR 124 and 270 (12-021). In accordance with the requirements in 40 CFR 270, an owner or operator of a facility at which hazardous waste will be treated, stored, or disposed must apply for and receive a RCRA permit prior to construction of the facility (12-018).

Owners and operators of facilities that treat, store, or dispose of hazardous waste are required to submit a comprehensive permit application covering all aspects of the design, operation, and maintenance of the facility (12-021). The permit lays out the standards and requirements applicable to the specific activities conducted at that facility, including both the general facility standards and the standards applicable to each type of unit at the facility (12-019).

A permit for a new hazardous waste land disposal facility or site shall not be issued until the IDEQ has given 90 days notice to the board of county commissioners of the county in which the GNEP facilities or site is to be located (12-016).

It typically takes several years for EPA to issue a permit. Therefore, although owners and operators of new hazardous waste management facilities are only required to submit the permit application at least 180 days before physical construction of the facility is expected to commence [40 CFR 270.1(b)] (12-011), the permit application should be prepared early in the planning process because physical construction cannot commence until the permit is issued (12-021). Once a RCRA permit has been approved, it is valid for a period of up to 10 years (40 CFR 270.50) (12-011, 12-018). The *Hazardous Waste Facility Siting Act* (Idaho Code, Chapter 58, Title 39) stipulates that an ordinance, permit requirement or other requirement of a city or county shall not prohibit the construction of a hazardous waste treatment, storage, or disposal facility in that city or county (12-015).

12.4.5.3 Generator Requirements

The standards applicable to generators of hazardous waste are found at 40 CFR 262. These regulatory requirements vary according to the amount of hazardous waste generated on a monthly basis. Large quantity generators (LQGs, generating more than 2,200 pounds per month) are required to obtain an EPA identification number. A LQG may accumulate hazardous waste on-site for up to 90 days without a permit as long as they comply with storage standards for containers and tanks, and conduct proper operating, maintenance, and inspection procedures.

Conditionally exempt small quantity generators, less than 220 pounds of hazardous waste per month, are required to follow the regulations in 40 CFR 261.5 but are not subject to the generator requirements in 40 CFR 262.

Small quantity generators, more than 220 pounds but less 2,200 pounds of hazardous waste per month, may accumulate up to 13,230 pounds of hazardous wastes for 180 days, or 270 days if the wastes must be transported 200 miles or more for treatment or disposal, without obtaining a permit.

The LQGs that accumulate wastes onsite for more than 90 days are classified as operators of hazardous waste storage facilities and must obtain a RCRA storage permit.

12.4.5.4 Solid Waste Management and Disposal

In conjunction with counties and public health districts, IDEQ's State Response Program oversees the development and operation of municipal and non-municipal solid waste disposal sites in Idaho (12-047). The State of Idaho Legislature approved the *Solid Waste Management Rules* (IDAPA 58.01.06) for all solid waste and solid waste management facilities in Idaho to regulate solid waste treatment or disposal and licensure and certification requirements. Pursuant to the *Solid Waste Management Rules*, approval of location restrictions, the Operating Plan, Design Application, and the Closure Plan by the IDEQ is required for all new non-municipal solid waste management facilities (12-042, 12-043, 12-044, 12-132).

The Siting, Operating Plan, and Design Application approval processes may occur concurrently. Siting approval is required prior to construction of the facility (12-044). Operating Plan and Design Application approval are required prior to operation of the facility (12-042, 12-043). A pre-application meeting with the IDEQ and the SDHD is recommended before the site approval, Operating Plan, or design applications are submitted to ensure compliance with locations restrictions and operational requirements and to expedite the approval process (12-042, 12-043, 12-044).

The application is valid for a period of 2 years. If the owner and operator fail to begin construction within 2 years from the date of approval, the application approval will become invalid (12-132).

12.4.6 Historical Resource Requirements

Section 106 of the NHPA requires Federal agencies to determine if their actions would affect historic resources. If a potential for effect on historical resources is found, the agency is required to consult with the Advisory Council on Historic Preservation and the Idaho SHPO for the state in which the resources exist. Such consultations generally result in the development of agreements that include stipulations to be followed to minimize or mitigate potential adverse impacts to historic resources. Federal regulations found at 36 CFR 800 (12-095) set forth procedures for initiating and conducting the Section 106 process.

12.4.7 Radioactive Waste Shipments in Idaho

In October 1995, the State of Idaho, DOE, and U.S Navy entered into a settlement agreement resolving issues related to receipt of spent nuclear fuel at the INL (12-136). The agreement includes provisions that define the amount of spent nuclear fuel that can be accepted at the INL. Shipments of fuel to the INL are tied to accomplishment of certain waste treatment and shipment milestones. That is, they are contingent upon the removal of waste volumes prior to receipt of any spent nuclear fuel from any generator. The agreement also addresses the types of fuel that can be received at INL. One provision states that spent nuclear fuel from commercial nuclear power plants will not be shipped to INL. The 1995 Settlement Agreement is limited in its application to the INL site and should not affect the availability of the Atomic City site for receipt of spent nuclear fuel.

Idaho is also a party to the Pacific States Agreement on Radioactive Materials Transportation Management, Idaho Code 30-3029 (12-127). A representative of the Idaho legislature serves on a transportation committee that works to coordinate transportation plans and requirements for radioactive materials between the states and to implement requirements such as inspection procedures and uniform safety standards that complement the federal transportation requirements.

12.4.8 State Involvement in Licensing Radioactive Materials

The NRC has authority under the AEA to relinquish to the states certain portions of its licensing and regulatory authority. This includes programs for by-product materials, source material and certain quantities of special nuclear materials. The state Governors may enter into agreements with the NRC to assume such programs. The State of Idaho has a Radiation and Nuclear Material Act (12-127). However, the state does not have an agreement with the NRC and is not involved in licensing by-product, source or special nuclear materials (12-133).

12.5 Local Regulations and Permits

This section addresses the local regulatory requirements that would be involved with construction of GNEP facilities at the Atomic City site.

12.5.1 Local Land Use Plans and Zoning Ordinances

The Atomic City site is located on privately owned land near Atomic City in Bingham County, Idaho. The site consists of approximately 3,300 acres of undeveloped property in Sections 4 through 10 and 15 through 18 of Township 1 North, Range 31 east, Boise meridian, surrounded by undeveloped ranchland to the east, south, and west, and the INL to the north. Sections 1 through 18 in Township 1 North, Range 31 east, Boise meridian are currently zoned for agricultural use, with the exceptions of Atomic City and a portion in the southeast area of Section 3, which is zoned C2 – Heavy Commercial (12-050).

Title 67, Chapter 65 of the Idaho Code, the Local Land Use Planning Act, requires each Planning and Zoning Commission to prepare a comprehensive plan that includes all of the land within its jurisdiction (§ 67-6508) (12-017). The Bingham County Planning and Zoning Board developed a Comprehensive Plan, which includes goals, policies, rationale, and implementation activities in relation to 14 components (e.g., property rights, population, economic development, land use, natural resources, hazardous areas, etc.) (12-128). In addition, Bingham County has developed Zoning Ordinances that govern development activities and implement the policies in the comprehensive plan (12-009). Requests for an amendment to the zoning ordinance must be submitted to the Planning and Zoning Commission, which evaluates the request to determine the extent and nature of the amendment requested (12-017).

12.5.1.1 Heavy Industrial Use Zoning Status

To accommodate the GNEP facilities, an application to change the zoning of the site from agricultural use (A) to heavy industrial/manufacturing use (M2) would be required (12-049). The zoning change must be finalized prior to construction of the facility. Section 6.1.1 of the Bingham County Planning and Zoning Ordinances states that, “No building, structure or land shall be used or occupied and no building or structure or part thereof shall be erected, constructed, reconstructed, moved or structurally altered except in conformity with all the regulations herein specified for the district in which it is located and until a proper Building and/or Zoning Permit is obtained” (12-009).

Prior to adopting, revising or rejecting an amendment to the Zoning Ordinance, the Planning and Zoning Commission must conduct at least one public hearing. Within 30 days after receipt, the application will either be approved or disapproved (12-009).

12.5.1.2 Compatibility of Classification

According to the Bingham County Zoning Ordinance, a heavy manufacturing district should be located where it will have minimum impact on surrounding land uses, be removed from the residential zones, and have ready access to adequate transportation arterials (12-009). The criteria to change the zone designation to heavy industrial/manufacturing are:

- Accessibility to road or air transportation when necessary for efficient operation,
- Sufficiently located away from urban areas to minimize environmental effects on neighboring uses,
- Sufficiently located to minimize encroachment on residential or commercial uses,
- Tract or parcel adequately sized for immediate use and future growth,
- Accessibility to adequate utilities, and
- Location that minimizes potential traffic problems (12-009).

All of these criteria are met at the Atomic City site. Furthermore, it is the policy of Bingham County to carry out a program on a continuing basis to fully explore commercial and industrial expansion potentials that are beneficial to the county (12-128).

The Bingham County Zoning Ordinance states that no land or building in any district shall be used or occupied in any manner creating a dangerous, injurious, noxious or otherwise objectionable condition that could adversely affect the surrounding areas or adjoining premises, except that any use permitted by this Ordinance is undertaken with acceptable measures and safeguards to reduce dangerous and objectionable conditions, as follows:

- Any activity involving the use or storage of flammable or explosive material shall be protected by adequate fire-fighting and fire-preventative equipment,
- No activity shall emit radioactivity above Federal guidelines,
- Unreasonable noise that is due to volume, frequency, or beat shall be muffled or otherwise controlled, and
- Air pollution created by emissions, water pollution, and hazardous waste shall be subject to local, state, or Federal requirements and regulations (12-009).

Prior to the issuance of a Zoning Permit, a statement and plans indicating the manner in which dangerous and objectionable elements involved in processing and equipment operations are to be eliminated or reduced to acceptable limits and tolerances are required.

12.5.2 Bingham County Building, Zoning, and Mechanical Permits

The Bingham County Building/Zoning/Mechanical Permit Application Form must be completed by the facility owner, reviewed by the Building Official and approved by the Zoning Administrator prior to the issuance of a Building Permit (12-048). The permit will expire if work prescribed in the permit has not begun within 1 year after issuance of the permit (12-009).

12.5.3 On-Site Wastewater Systems

On-site wastewater systems use a septic tank and underground (subsurface) drainfield to treat wastewater on-site. The wastewater is discharged into the tank, where the solids and water are separated. The solids settle to the bottom of the tank, and the water flows from the tank into the drainfield, which consists of underground pipes surrounded by gravel and soil. The pipes slowly release the water, and the gravel and soil filter out remaining contaminants before the water reaches the groundwater. A properly designed, located, constructed, and maintained septic system is imperative to protecting human health and the environment (12-113).

In accordance with the requirements in the Bingham County Zoning Ordinance, all domestic wells and individual septic systems shall comply with relevant IDWR, Health Department, and/or the IDEQ rules, regulations, and guidelines (12-009). The Environmental Health Division of the SDHD is responsible for enforcing public health laws and regulations designed to protect the public and environment from factors that could have a negative impact on individuals, the community, or the environment. The SDHD provides oversight for septic systems using the Rules for Individual and Subsurface Sewage Disposal Systems (IDAPA 58.01.03) and issues septic system permits (12-057).

In order to have a septic system installed, the property owner must obtain a permit from the SDHD. It is also recommended that the property owner have a site evaluation performed by the SDHD and a licensed septic system installer before applying for a permit and before purchasing property because not all property is suitable for septic systems.

According to the *Wastewater Rules* (IDAPA 58.01.16), every wastewater system under private or public ownership that is generating, collecting or treating 2,500 gallons or more a day is a public wastewater system (12-083) that is categorized as a “Large Soil Absorption System (LSAS).” In addition to complying with the general criteria for septic systems, the design for these LSAS wastewater systems must be prepared by a professional engineer licensed by the State of Idaho and reviewed by the IDEQ (12-113). The construction, alteration, or expansion of any LSAS wastewater treatment or disposal facility must not begin before plans and specifications for the GNEP facilities have been submitted to and approved by the IDEQ (12-081).

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TABLES

13. CONSTRUCTION COSTS

An evaluation of the relative cost of heavy construction projects in the area, as compared to the RSMeans U.S. 30-city average is addressed in this section. The weighted average cost factor for all elements of materials and installation in the Eastern Idaho / Pocatello area is 0.902. This cost ratio indicates that this area experiences significantly lower construction costs than the 30-city average.

13.1 Relative Costs for Heavy Construction Projects

Reed Construction Data is a market leader of construction cost information. RSMeans is a product line of Reed Construction Data, which provides accurate and up-to-date cost information that helps owners, developers, architects, engineers, contractors and others to project and control the cost of both new building construction and renovation projects. RSMeans contains nationwide analyzed annual industry construction costs, from which a 30-city average cost index is derived for all facets of the industry. The 30-city average cost index is set at 1.0. The RSMeans 30-city average for heavy construction projects can be commercially obtained from their web site RSMeans.com.

This same source is used to develop a regional cost for similar activities based on zip code. The regional cost index can then be compared to the 30-city average cost index to obtain a cost ratio.

The relative costs for Heavy Construction in the Eastern Idaho / Pocatello area were taken from the RSMeans CostWorks 2007 data (13-001). The weighted average cost factor for all elements of materials and installation in the Eastern Idaho / Pocatello area is 0.902. This cost ratio indicates that this area experiences significantly lower construction costs than the 30-city average. More detail on material and installation factors for individual unit cost factor elements relating to Heavy Construction is provided in Tables 13-1 and 13-2.

Table 13-1. Heavy construction material and installation assembly factors (reproduced from CostWorks 2007 ©2006) (13-001).

Division	Material	Installation	Total
ASSEMBLY FACTORS			
A Substructure	0.987	0.853	0.908
B10 Shell: Superstructure	1.093	0.767	0.969
B20 Exterior Closure	1.190	0.609	0.914
B30 Roofing	0.924	0.697	0.840
C Interior Construction	0.965	0.721	0.863
D10 Services: Conveying	1.000	0.767	0.935
D20-D40 Mechanical	0.999	0.729	0.889
D50 Electrical	0.914	0.750	0.835
E Equipment and Furnishings	1.000	0.787	0.988
G Site Work	0.813	1.010	0.950
A-G WEIGHTED AVERAGE	1.016	0.751	0.902

Table 13-2. Heavy construction material and installation cost factors (reproduced from CostWorks 2007 ©2006) (13-001).

Division	Material	Installation	Total
UNIT COST FACTORS			
01590 Contractor equipment	0.000	1.011	1.011
02 SITE CONSTRUCTION			
02300 Earthwork	0.591	1.013	0.946
02400, 02450 Tunneling & Load-Bearing Element	1.033	0.971	1.001
02700 Bases & Pavements	0.975	1.120	0.990
02500, 02600 Utility Services & Drainage	0.966	0.699	0.971
02800 Site Improvements	1.047	1.099	1.068
02900 Planting	0.883	0.983	0.930
03 CONCRETE	1.068	0.799	0.941
03100 Concrete Forms & Accessories	0.986	0.782	0.811
03200 Concrete Reinforcement	1.079	0.747	0.916
03300 Cast In-Place Concrete	0.996	0.854	0.942
03400 PreCast Concrete	1.219	0.759	1.159
04 MASONRY	1.274	0.618	0.881
04050 Basic Masonry Materials & Methods	1.021	0.682	0.868
04200 Masonry Units	1.306	0.621	0.895
04400 Stone	1.308	0.601	0.848
04500 Refractory	0.979	0.464	0.525
05 METALS	1.120	0.740	1.005
05100 Structural Metal Framing	0.896	0.709	0.843
05200, 05300 Metal Joists & Decking	1.239	0.751	1.080
05500 Metal Fabrications	1.000	0.722	0.954
06 WOOD & PLASTICS	0.945	0.788	0.862
06100 Rough Carpentry	0.911	0.789	0.831
06200 Finish Carpentry	0.991	0.781	0.968
07 THERMAL & MOISTURE PROTECTION	0.925	0.665	0.820
07100 Dampproofing and Waterproofing	0.792	0.781	0.783
07200, 07800 Thermal Fire & Smoke Protection	0.886	0.548	0.795
07400, 07500 Roofing & Siding	0.983	0.947	0.968
07600 Flashing & Sheet Metal	1.000	0.449	0.572
08 DOORS AND WINDOWS	0.943	0.681	0.875
08100 -08300 Doors & Frames	0.969	0.762	0.915
08800,08900 Glazing & Glazed Curtain Walls	0.968	0.356	0.720
09 FINISHES	0.987	0.710	0.844
09200 Plaster & Gypsum Board	0.869	0.781	0.817
09300, 09400 Tile & Terrazzo	0.939	0.720	0.829
09500, 09800 Acoustical Ceilings & Treatment	1.110	0.781	0.912
09600 Flooring	0.990	0.519	0.864
09700, 09900 Finishes & Painting	0.995	0.508	0.703
DIVISION 10-14	1.000	0.769	0.952
15 MECHANICAL	0.999	0.729	0.889
150-152, 154 Plumbing: Piping, Fixtures & Equip	1.000	0.743	0.883
15300, 13900 Fire Protection/Suppression	1.000	0.698	0.808
15500 Heat Generation Equipment	0.992	0.693	0.882
15600-15800 Air Conditioning & Ventilation	1.00	0.751	0.985
16 ELECTRICAL	0.914	0.750	0.835
1-16 WEIGHTED AVERAGE	1.016	0.751	0.902

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14. STORAGE CAPABILITY

The Atomic City site is located in the arid high-desert ranchland of east-central Idaho and consists of 3,310 acres. This section addresses storage potential and waste management capability.

14.1 Atomic City Site Storage Capability

The Atomic City site is located on privately owned land near Atomic City in Bingham County, Idaho (14-001). The site consists of 3,310 acres of undeveloped property. Sections 1 through 18 in Township 1 North, Range 31 East Boise Meridian are currently zoned for agricultural use, with the exceptions of Atomic City and a portion in the Southeast area of Section 3, which is zoned C2 – Heavy Commercial. The proposed site exceeds the minimum size requirements of 500 contiguous acres for locating both GNEP Consolidated Fuel Treatment Center demonstration facility and/or the Advanced Burner Reactor, as well as supporting storage facilities. The low density of population and existing structures in the area increases the feasibility of future site expansion should it be deemed to be advantageous.

14.2 Waste Management Capability

Ultimately, the most important aspect of any waste management/storage program is the ability to disposition waste effectively and, thereby, prevent accumulation. The facilities are likely to generate a mixture of high-level waste, mixed waste, transuaranic waste, and low-level waste. There are existing, or planned, federal or commercial facilities and disposition routes for all of these streams and only interim storage of each stream at the Atomic City site is required.

The low-level waste to be generated by the GNEP facilities could be packaged on-site, then transported to and disposed of in the Energy*Solutions* facility in Clive, Utah. All components of this disposition path are completely within Energy*Solutions*' corporate portfolio of services, enabling reliable, efficient, uninterrupted disposition services for this waste.

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FIGURES

15. OTHER FACILITIES

This section identifies the potential hazardous facilities and activities located within five miles of the Atomic City GNEP site as well as any major airports within 10 miles of the Atomic City site.

15.1 Overview and Summary

Two sites that formerly involved hazardous facilities and activities are associated with the INL and lie just within the 5-mile radius of the Atomic City site. These are the Federal Aviation Administration (FAA) Test Facility B-27-606 and a portion of INL WAG 5, the Auxiliary Reactor Area (ARA). Remediation of these sites has been completed; therefore, no hazardous constituents remain on them.

The U.S. Navy performed practice firing within the INL boundary from 1943 to 1948, but trajectories did not fall within the 5 mile radius of the Atomic City site. There is no record of any stray ordnance being discovered within this area.

There are no major airports within 10 miles of the Atomic City site. The nearest major airport is in Idaho Falls, approximately 35 miles to the east.

15.2 Hazardous Waste Facilities

Two CERCLA sites that lie within 5 miles of the Atomic City site are identified as INL facilities in Figure 15-1. These are the FAA Test Facility B27-606 (Figure 15-2) and a portion of INL WAG 5, the ARA. Specifically, a portion of Operable Unit 5-12, ARA I and II sites, falls within the 5-mile buffer zone (Figure 15-3). The Remedial Action Report for the Operable Unit 5-12 Remedial Action (15-001) describes the sites and their current state. All contaminated facilities and surrounding soils have been removed; therefore, OU 5-12 no longer contains hazardous contaminants and the sites closed (15-002, 15-003). Groundwater is monitored in the vicinity of these sites and is discussed in the *Annual Groundwater Monitoring Status Report for the Waste Area Group 5 for Fiscal Year 2006* (15-004).

The U.S. Navy conducted firing practice within the INL boundary using the Big Southern Butte as one of its targets. The path of ordnance and contaminated soils trends northeast to southwest across portions of the INL from the firing and bombing range activities toward the Big Southern Butte. The path is outside the 5 mile radius of the Atomic City site. Investigations and removal actions were primarily concentrated north and west of the Atomic City site within the INL site boundary (15-005 and 15-006); however, there is no known record of ordnance being found within the 5-mile radius (Figure 15-4). The possibility that ordnance exists within the Atomic City site is unlikely because the established path for spent ordnance toward the butte bypasses the Atomic City site (Figure 15-4). There are no known encounters of ordnance during any historical and/or current agricultural activities in the area.

15.3 Major Airports and Rural Air strips

There are no major airports within the 10-mile radius as illustrated on Figure 15-5. Atomic City has a small public airport (Midway Airport) with a single unpaved, unlit runway with no tower. The Big Southern Butte dirt air strip is the next closest rural air strip located just inside of the 10-mile radius west of the Atomic City site, but is not maintained and rarely used. Major airports outside of the 10-mile radius include Idaho Falls Regional Airport, located approximately 35 miles east of Atomic City, and Pocatello Regional Airport, located approximately 40 miles south and east of the Atomic City site. Rural air strips outside of the 10-mile radius include McCarley air strip in Blackfoot, approximately 25 miles south and east of the Atomic City site, and the Arco-Butte County air strip in Arco, approximately 20 miles north and west of the Atomic City site.

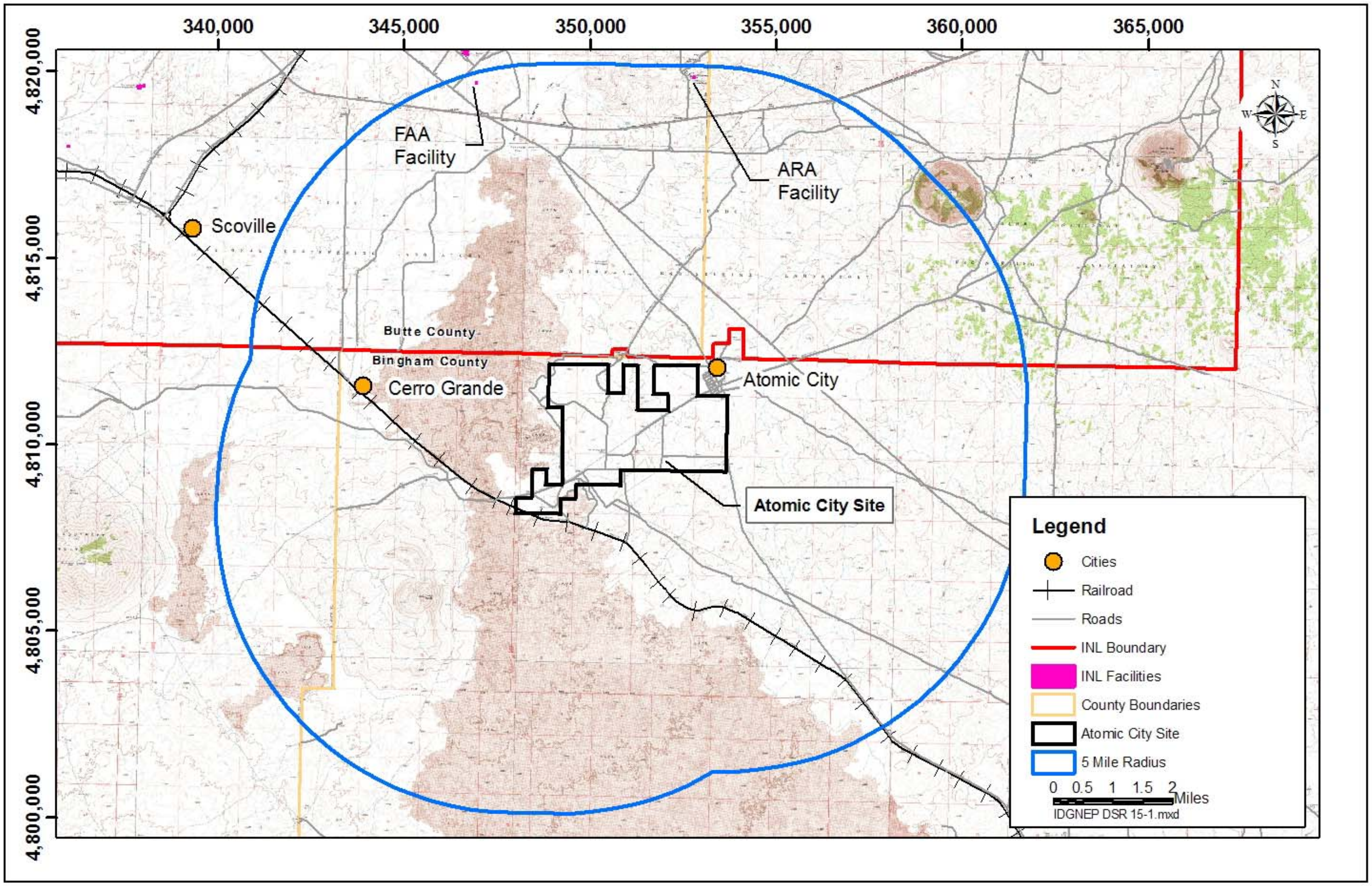

Figure 15-1. Five-mile radius view relative to the perimeter of the Atomic City site.

Figure 15-2. Aerial view of FAA Test Facility B27-606.

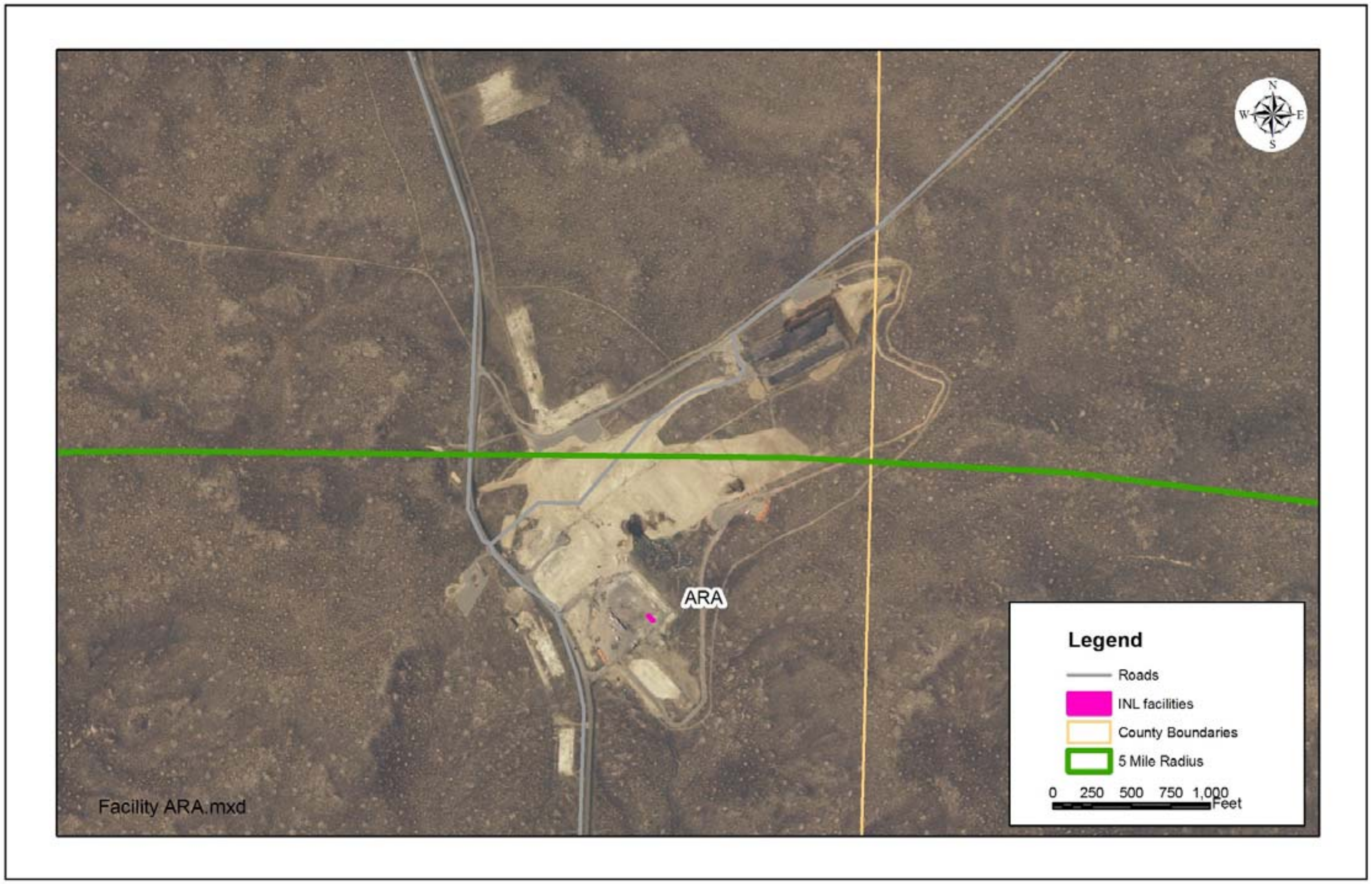

Figure 15-3. Aerial view of decommissioned ARA.

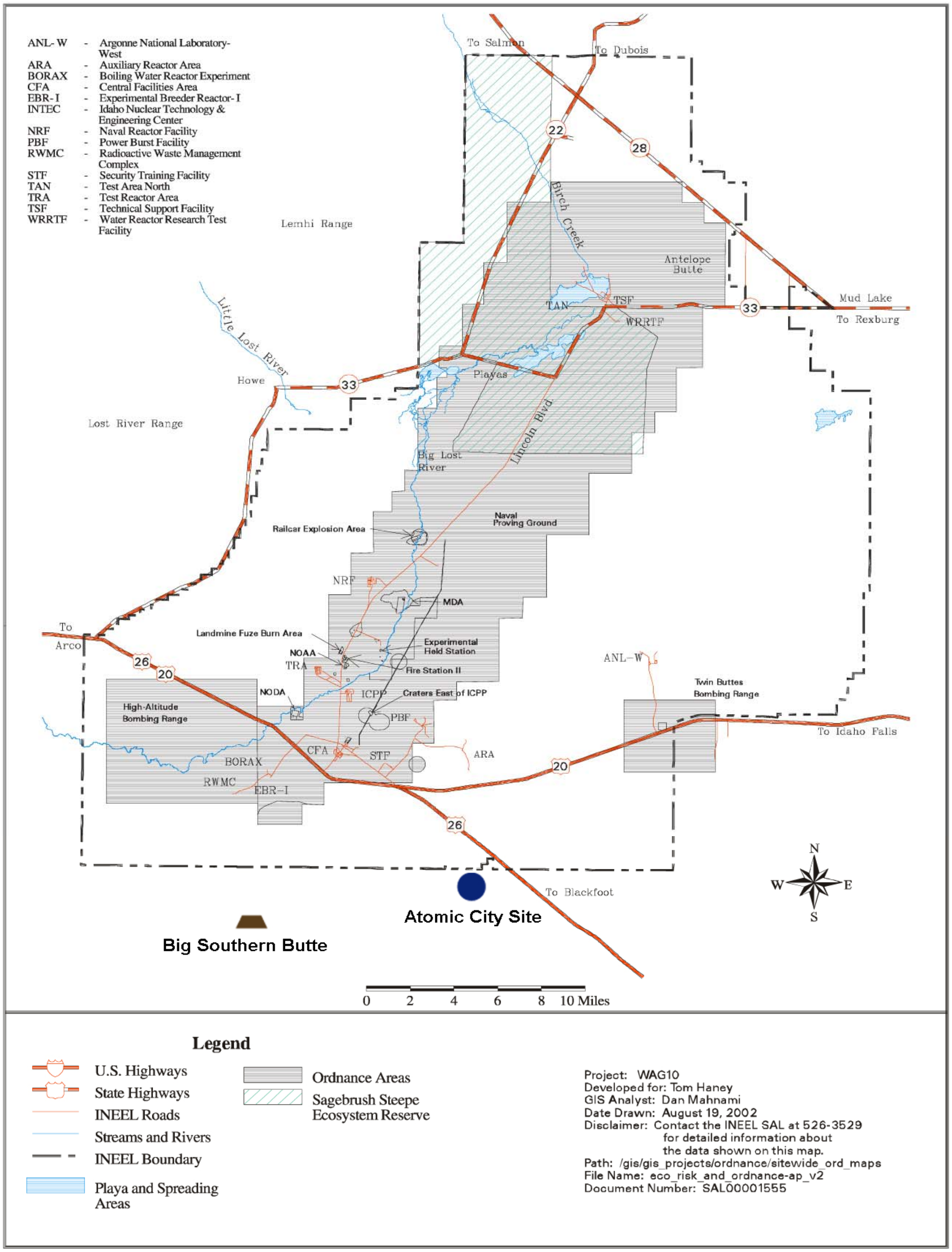

Figure 15-4. Former Ordnance Use Area.

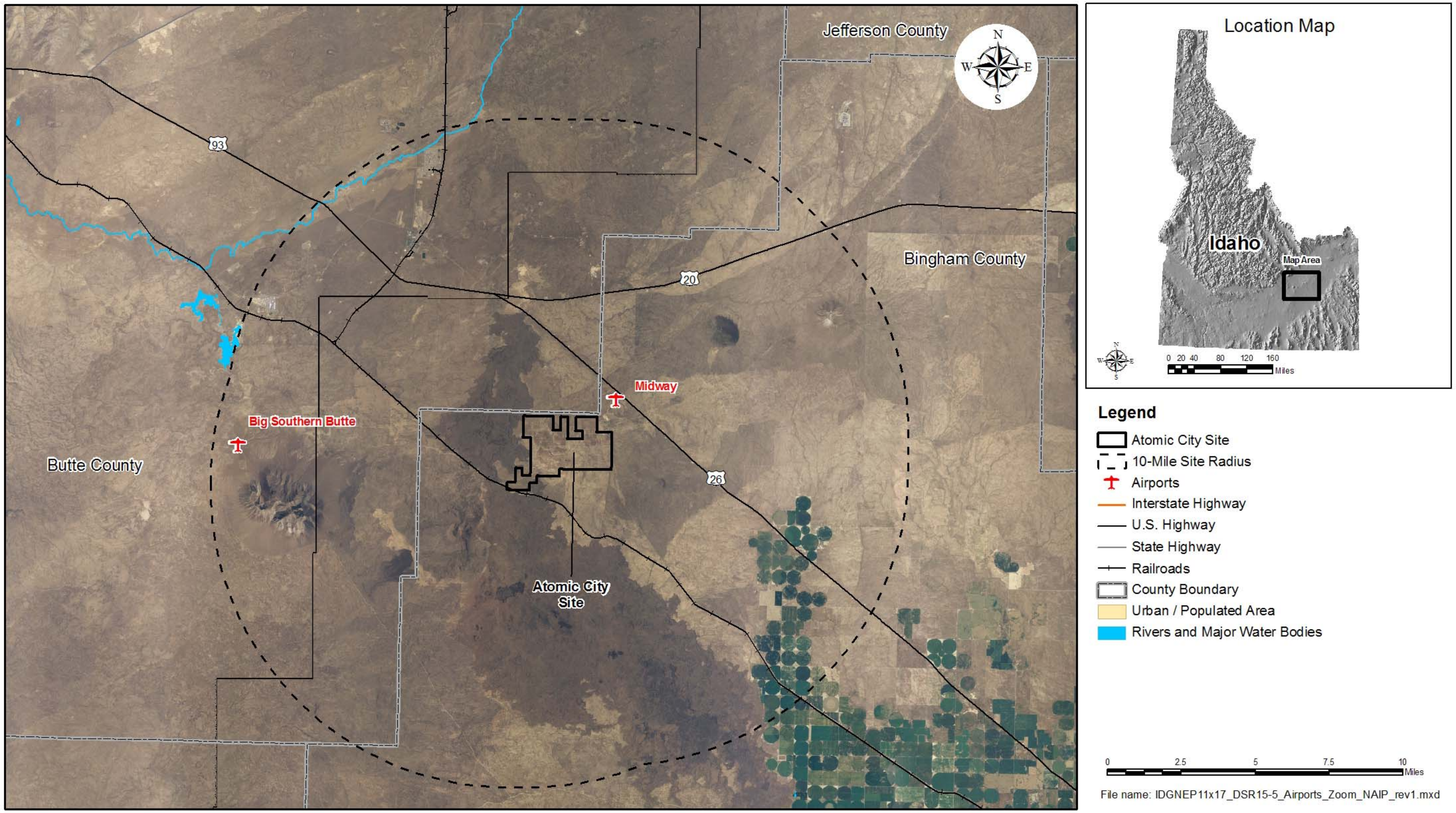

Figure 15-5. Airport locations (10-mile radius) outside the perimeter of the Atomic City site.

15.4 Bibliography

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CONTENTS

FIGURES

16. NATIONAL PRIORITIES LIST OR CERCLIS DATABASE

This section discusses whether the Atomic City site, or any portion thereof, is on the National Priorities List (NPL) or is included in the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database.

16.1 Overview and Summary

A search of the EPA NPL database established that no part of the Atomic City site appears on the NPL or has ever appeared on it. A search of the EPA CERCLIS database similarly established that no part of the Atomic City site has appeared or has ever appeared in CERCLIS.

16.2 National Priorities List

The NPL is the prioritized list of sites with known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States and its territories. The NPL is intended primarily to guide the EPA in determining which sites warrant further investigation. The NPL sites can be identified at http://www.epa.gov/superfund/sites/npl/npl.htm. Information regarding new and proposed NPL sites and the cleanup progress related to those sites is also available on the NPL website (16-001).

16.2.1 Atomic City Site Current and Past Listing Status

A search of the EPA NPL database definitively established that the Atomic City site does not appear and has never appeared on the NPL.

16.2.2 Adjacent or Nearby Sites

A search of the EPA NPL database identified one NPL site located within a 20-mile radius of the Atomic City site. This site, the INL, is adjacent to the north boundary of the Atomic City site. The INL is listed on the NPL as the INEL. The location of the INL relative to the Atomic City site is shown in Figure 16-1.

16.2.2.1 Current Listing Status

The INL is located within Butte, Clark, Jefferson, Bingham, and Bonneville Counties. Its southern boundary adjoins the northern boundary of the Atomic City site. It was initially proposed to the NPL on July 14, 1989. The EPA placed the INL on the NPL on November 21, 1989. The NPL number for the INL is ID4890008952. The INL is undergoing cleanup pursuant to a Federal Facility Agreement/Consent Order between DOE, the State of Idaho, and the EPA.

16.2.2.2 Past Listing Status

No other sites located within a 20-mile radius of the Atomic City site have ever been listed on the NPL.

16.3 CERCLIS Database

The CERCLIS is a database that contains information on hazardous waste sites, potentially hazardous waste sites, and remedial activities across the nation. The CERCLIS database displays site information for NPL sites (i.e., sites proposed for NPL status, sites currently on the final NPL, or sites deleted from the final NPL) in a standardized site progress profile format. The profile includes information such as the current status of cleanup efforts, the cleanup milestones that have been reached, and the quantity of liquid and solid-based media treated. The CERCLIS database was searched using the search tool found at http://cfpub.epa.gov/supercpad/cursites/srchsites.cfm. The EPA Envirofacts Database was also searched using the search tool found at http://www.epa.gov/enviro/html/cerclis/cerclis_query.html (16-002).

16.3.1 Atomic City Site Current and Past Listing Status

A search of the EPA CERCLIS database definitively concluded that the Atomic City site does not appear and has not appeared in the CERCLIS database.

16.3.2 Adjacent or Nearby Sites

A search of EPA's CERCLIS database identified one site located within a 20-mile radius of the Atomic city site. This site, the INL, is adjacent to the north boundary of the Atomic City site.

16.3.2.1 Current Listing Status

The INL is located within Butte, Clark, Jefferson, Bingham, and Bonneville Counties. Its southern boundary adjoins the northern boundary of the Atomic City site. The CERCLIS EPA identification number for the INL is ID4890008952. The INL is undergoing cleanup pursuant to a Federal Facility Agreement/Consent Order between the DOE, the State of Idaho, and the EPA.

16.3.2.2 Past Listing Status

No other sites located within a 20-mile radius of the Atomic City site have ever been listed in the CERCLIS database.

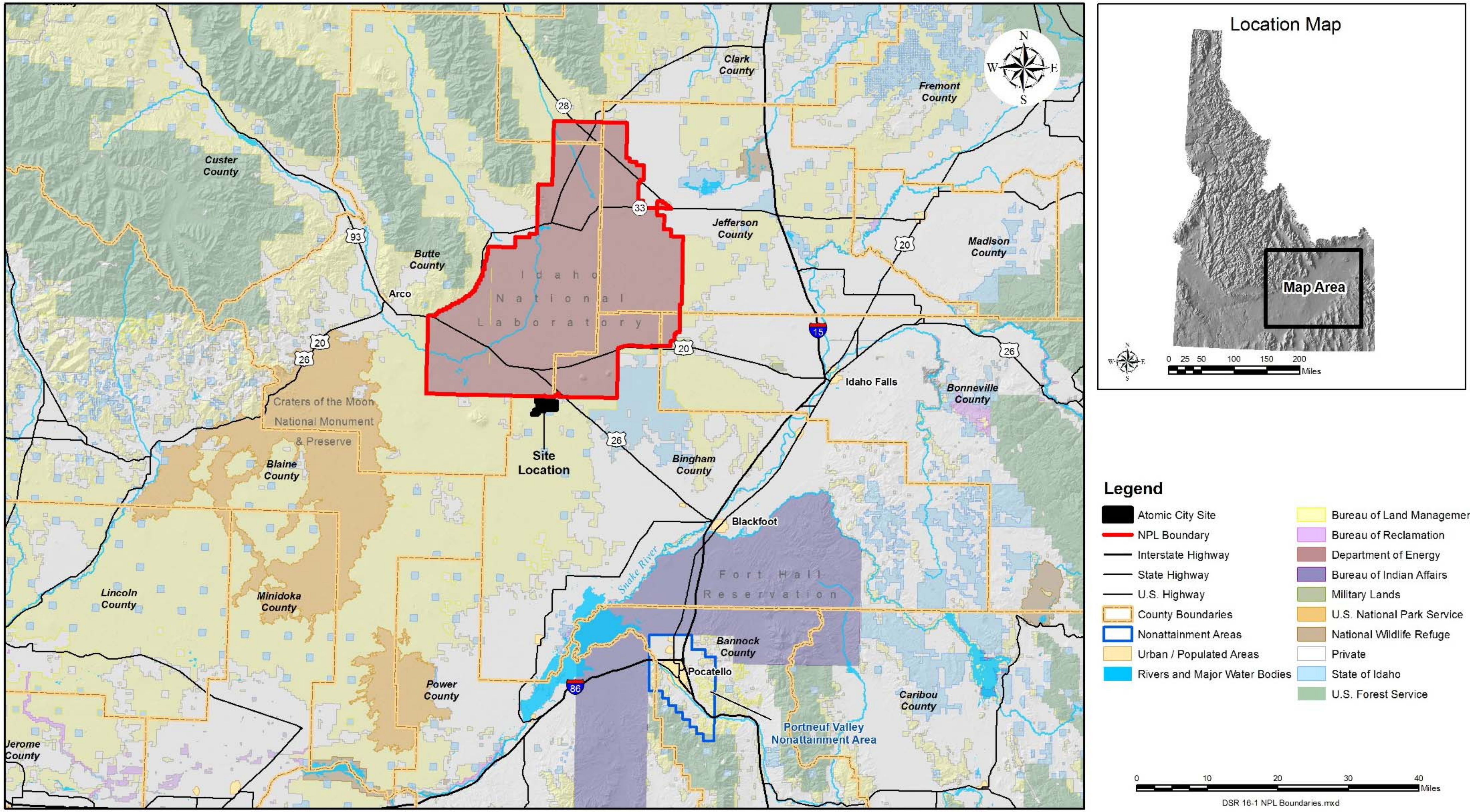

Figure 16-1. Atomic City site location and NPL site locations.

16.4 Bibliography

16-001. U.S. Environmental Protection Agency. 2006. *U.S. Environmental Protection Agency, National Priorities List Sites in the United States*. Accessed February 7, 2007. http://www.epa.gov/superfund/sites/npl/npl.htm and http://cfpub.epa.gov/supercpad/cursites/srchsites.cfm.

16-002. U.S. Environmental Protection Agency. 2006. *U.S. Environmental Protection Agency, Superfund Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Database*. Accessed February 7, 2007. http://www.epa.gov/enviro/html/cerclis/cerclis_query.html and http://cfpub.epa.gov/supercpad/cursites/srchsites.cfm.